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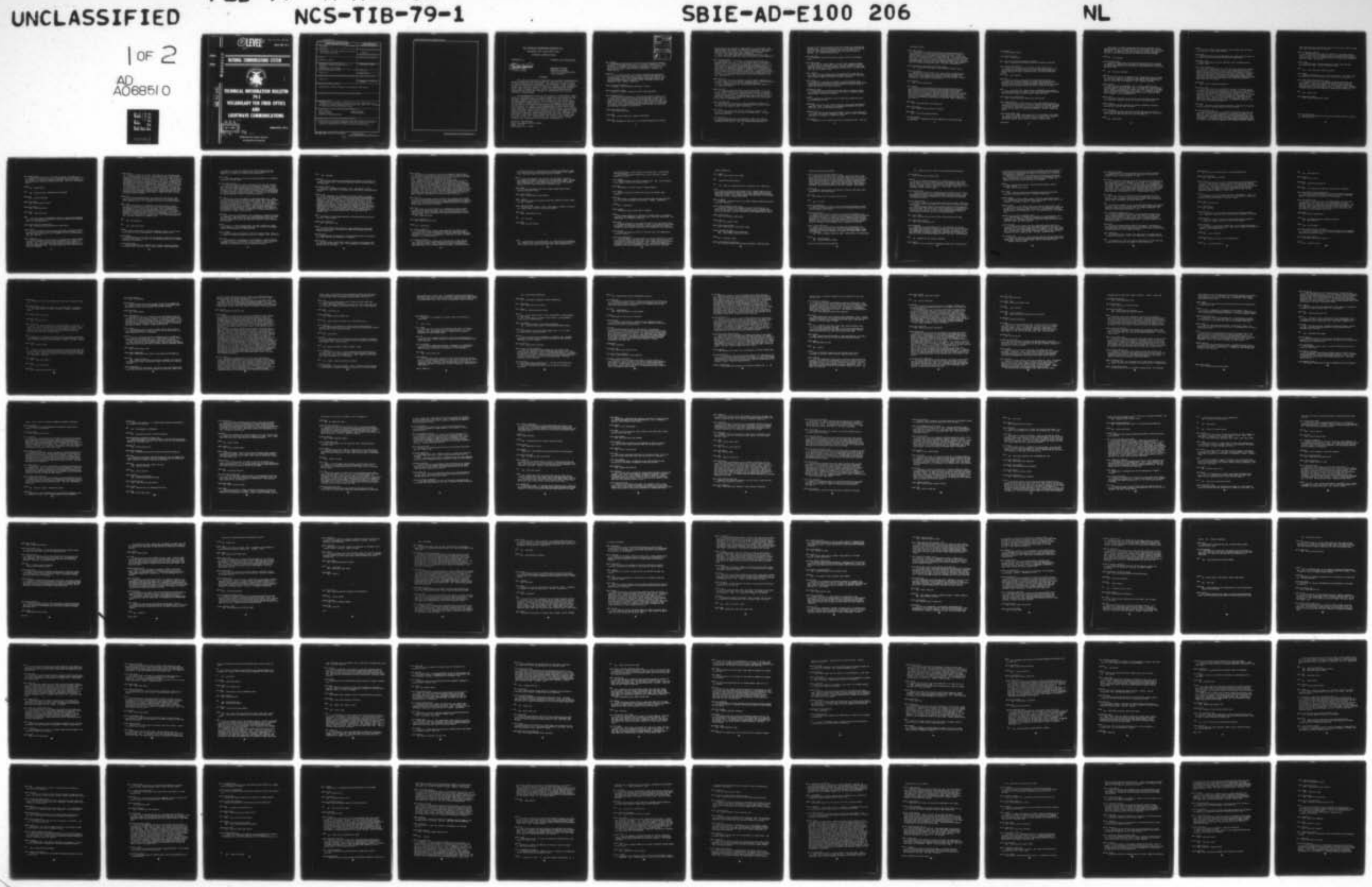

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TECHNICAL INFORMATION BULLETIN 79-1

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A dictionary containing approximately 1430 entries, including inversions and cross-references, covering fiber optics and lightwave communications terms and their definitions.

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VOCABULARY FOR FIBER OPTICS AND LIGHTWAVE COMMUNICATIONS

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FOREWORD

The aim of vocabulary standards is to promote communication, enhance understanding and provide for precision in the writing of specifications and standards. The emerging fields of fiber optics and lightwave communications is lacking a good vocabulary. During the next few years, as lightwave communication systems using light sources, optical fibers, and photodetectors are developed and installed, changes in technology will require changes in terminology.

In performance of part of its mission of developing communication standards for the Federal community, the Office of the Manager, National Communications System, is distributing for use and comment this initial draft vocabulary for fiber optics and lightwave communications. It is a by-product of an effort on the part of the United States Military Communications-Electronics Board to revise Allied Communication Publication (ACP) 167: Glossary of Communications-Electronics Terms. It is recognized that many terms in the general field of telecommunications, teleprocessing, and related electronics that also apply to fiber optics and lightwave communications have not been included in this TIB, since they were already contained in the larger body of terms in ACP 167. Additional work on this TIB is needed. Comments are encouraged and should be addressed to:

Office of the Manager
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A

ABBE CONSTANT

A MATHEMATICAL EXPRESSION FOR DETERMINING THE CORRECTION FOR CHROMATIC ABERRATION OF AN OPTICAL SYSTEM. NOTE: IT IS USUALLY EXPRESSED AS $V = (N(D)-1)/(N(F)-N(C))$, OR REFRACTIVITY/DISPERSION, WHERE N(D), N(F), AND N(C) ARE THE INDICES OF REFRACTION FOR LIGHT OF THE WAVELENGTHS OF THE D LINE OF SODIUM, AND THE F AND C LINES OF HYDROGEN, RESPECTIVELY. SYNONYMS: NU VALUE; VEE VALUE.

ABERRATION

1. IN AN OPTICAL SYSTEM, ANY SYSTEMATIC DEPARTURE FROM AN IDEALIZED PATH OF LIGHT RAYS FORMING AN IMAGE, CAUSING THE IMAGE TO BE IMPERFECT. 2. IN PHYSICAL OPTICS, ANY SYSTEMATIC DEPARTURE OF A WAVE FRONT FROM ITS IDEAL PLANE OR SPHERCIAL FORM. NOTE: COMMON ABERRATIONS INCLUDE SPHERICAL AND CHROMATIC ABERRATION, COMA, DISTORTION OF IMAGE, CURVATURE OF FIELD, AND ASTIGMATISM. SEE: CHROMATIC ABERRATION.

ABSOLUTE LUMINANCE THRESHOLD

THE LOWEST LIMIT OF LUMINANCE NECESSARY FOR VISION.

ABSOLUTE LUMINOSITY CURVE

THE PLOT OF SPECTRAL LUMINOUS EFFICIENCY VERSUS WAVELENGTH.

ABSOLUTE MAGNIFICATION

THE MAGNIFICATION PRODUCED BY A LENS PLACED IN FRONT OF A NORMAL EYE AT SUCH A DISTANCE FROM THE EYE THAT EITHER THE REAR FOCAL POINT OF THE LENS COINCIDES WITH THE CENTER OF ROTATION OF THE EYE OR ELSE THE FRONT FOCAL POINT OF THE EYE COINCIDES WITH THE SECOND PRINCIPAL POINT OF THE LENS, ALL UNDER THE CONDITION THAT THE OBJECT IS LOCATED CLOSE TO THE FRONT FOCAL POINT OF THE LENS. NOTE: THIS MAGNIFICATION IS NUMERICALLY EQUAL TO THE DISTANCE OF DISTINCT VISION DIVIDED BY THE EQUIVALENT FOCAL LENGTH OF THE LENS, WITH BOTH DISTANCES EXPRESSED IN THE SAME UNITS.

ABSOLUTE REFRACTIVE INDEX

SEE: REFRACTIVE INDEX.

ABSORPTANCE

SEE: INTERNAL ABSORPTANCE; SPECTRAL ABSORPTANCE.

ABSORPTION

THE TRANSFERENCE OF SOME OR ALL OF THE ENERGY CONTAINED IN AN ELECTRO-

MAGNETIC WAVE TO THE SUBSTANCE IT TRANSVERSES OR IS INCIDENT UPON. NOTE: ABSORBED ENERGY FROM INCIDENT OR TRANSMITTED LIGHT WAVES IS CONVERTED INTO ENERGY OF OTHER FORMS, USUALLY HEAT, WITHIN THE MEDIUM WITH A RESULTANT ATTENUATION OF THE LIGHT BEAMS. SEE: BOUGER'S LAW; EXTRAMURAL ABSORPTION; LIGHT ABSORPTION; SELECTIVE ABSORPTION.

SEE: ATOMIC DEFECT ABSORPTION; BULK MATERIAL ABSORPTION; FIBER ABSORPTION; EXTRAMURAL ABSORPTION; IMPURITY ABSORPTION; INTRINSIC ABSORPTION.

ABSORPTION COEFFICIENT

THE COEFFICIENT IN THE EXPONENT OF THE ABSORPTION EQUATION THAT EXPRESSES BOUGER'S LAW, VIZ. F = F(O) EXP NEG BX, WHERE F IS THE ELECTROMAGNETIC (LIGHT) FLUX OR INTENSITY AT THE POINT X, F(O) IS THE INITIAL VALUE OF FLUX AT X = O, AND B IS THE ABSORPTION COEFFICIENT. NOTE: IF AN INFINITESIMALLY THIN LAYER OF ABSORPTIVE MATERIAL IS CONSIDERED, MAKING X NEARLY ZERO, THE ABSORPTION COEFFICIENT IS PROPORTIONAL TO THE RATE OF CHANGE OF FLUX INTENSITY WITH RESPECT TO DISTANCE, I.E. IT IS PROPORTIONAL TO THE SLOPE OF THE ABSORPTION CURVE AT THAT POINT. THE ABSORPTION COEFFICIENT IS PROPORTIONAL TO THE RATE OF CHANGE OF FLUX INTENSITY WITH RESPECT TO DISTANCE, I.E. IT IS PROPORTIONAL TO THE SLOPE OF THE ABSORPTION CURVE AT THAT POINT. THE ABSORPTION COEFFICIENT IS A FUNCTION OF WAVELENGTH. SEE ALSO: ABSORPTIVITY.

ABSORPTION LOSS

WHEN A WAVE TRAVELS IN A MEDIUM, THE LOSS OF ENERGY, EXPERIENCED BY THE WAVE, CAUSED BY INTRINSIC MATERIAL ABSORPTION AND BY IMPURITIES CONSISTING PRIMARILY OF METAL AND OH IONS IN THE TRANSMISSION MEDIUM.

NOTE: ABSORPTION LOSSES MAY ALSO BE CAUSED FROM ATOMIC DEFECTS IN THE TRANSMISSION MEDIUM.

ABSORPTION PEAK

IN LIGHTWAVE TRANSMISSION MEDIA, SUCH AS GLASS, QUARTZ, SILICA, OR PLASTIC, USED IN OPTICAL FIBERS, SLAB DIELECTRIC WAVEGUIDES, INTEGRATED OPTICAL CIRCUITS, OR OTHER LIGHT CONDUCTING MEDIA, THE SPECIFIC WAVELENGTH AT WHICH A PARTICULAR IMPURITY, SUCH AS CU, FE, NI, V, CR, AND MN IONS, ABSORBS THE MOST POWER, I.E. CREATES MAXIMUM ATTENUATION OF THE PROPAGATED LIGHT WAVES. NOTE: ABSORPTION BY THESE IMPURITIES AT OTHER WAVELENGTHS IS LESS THAN THE ABSORPTION PEAK.

ABSORPTIVE MODULATION

MODULATION OF A LIGHT WAVE IN A MEDIUM CAUSED BY VARIATION OF AN APPLIED ELECTRIC FIELD THAT CAUSES VARIATIONS IN OPTICAL ABSORPTION NEAR THE EDGES OF THE ABSORPTION BAND OF THE MATERIAL.

ABSORPTIVITY

THE INTERNAL ABSORPTANCE PER UNIT THICKNESS OF A MEDIUM. NOTE: NUMERICALLY, ABSORPTIVITY IS UNITY MINUS THE TRANSMISSIVITY. SEE ALSO: ABSORPTION COEFFICIENT.

ACCEPTANCE ANGLE

THE ANGLE MEASURED FROM THE LONGITUDINAL CENTER LINE UP TO THE MAXIMUM ACCEPTANCE ANGLE OF AN INCIDENT RAY THAT WILL BE ACCEPTED FOR TRANSMISSION ALONG A FIBER. NOTE: THE MAXIMUM ACCEPTANCE ANGLE IS

DEPENDENT ON THE INDICES OF REFRACTION OF THE TWO MEDIA THAT DETERMINE THE CRITICAL ANGLE. FOR A CLADDED GLASS FIBER IN AIR, THE SINE OF THE MAXIMUM ACCEPTANCE ANGLE IS GIVEN BY THE SQUARE ROOT OF THE DIFFERENCE OF THE SQUARES OF THE INDICES OF REFRACTION OF THE FIBER CORE GLASS AND THE CLADDING. SEE: MAXIMUM ACCEPTANCE ANGLE.

ACCEPTANCE CONE

A CONE WHOSE INCLUDED APEX ANGLE IS EQUAL TO TWICE THE ACCEPTANCE ANGLE.

ACCEPTANCE PATTERN

FOR AN OPTICAL FIBER OR BUNDLE, A CURVE OF TOTAL TRANSMITTED POWER PLOTTED AGAINST THE LAUNCH ANGLE. NOTE: THE TOTAL TRANSMITTED POWER OR RADIATION INTENSITY IS DEPENDENT UPON THE INCIDENT INTENSITY, LAUNCH ANGLE (INPUT OR INCIDENT ANGLE), THE TRANSMISSION COEFFICIENT AT THE FIBER INTERFACE, AND THE ILLUMINATION AREA.

ACCESS COUPLER

A UNIT, SUCH AS A MIXING ROD, PLACED BETWEEN OPTICAL FIBER ENDS TO ENABLE SIGNALS TO BE WITHDRAWN FROM OR ENTERED INTO AN OPTICAL FIBER CABLE THAT IS PASSING THROUGH THE JUNCTION, STATION, OR POSITION.

ACCOMMODATION

A FUNCTION OF THE HUMAN EYE, WHEREBY ITS TOTAL REFRACTING POWER, ACCOMPLISHED BY A NEUROMUSCULAR FEEDBACK SYSTEM FROM THE FOVEA OF THE RETINA TO MUSCLES THAT CAUSE THE LENS TO THIN OR THICKEN, IS VARIED IN ORDER TO CLEARLY SEE OBJECTS AT DIFFERENT DISTANCES.

ACCOMMODATION LIMIT

THE DISTANCE OF THE NEAREST AND FARTHEST POINTS, AT WHICH AN OBJECT CAN BE CLEARLY FOCUSSED ON THE RETINA BY THE EYES OF AN OBSERVER, USUALLY VARYING FROM 4 TO 5 INCHES TO INFINITY.

ACHROMAT

A COMPOUND LENS CORRECTED TO HAVE THE SAME FOCAL LENGTH FOR TWO OR MORE WAVELENGTHS OF LIGHT.

ACHROMATIC

FREE FROM COLOR OR HUE, SUCH AS AN OPTICAL SYSTEM FREE FROM CHROMATIC ABERRATION. NOTE: AN ACHROMAT IS A COMPOUND LENS CORRECTED TO HAVE THE SAME FOCAL LENGTH FOR TWO OR MORE WAVELENGTHS.

ACHROMATIC LENS

A LENS, CONSISTING OF TWO OR MORE ELEMENTS, USUALLY MADE OF CROWN AND FLINT GLASS, THAT HAS BEEN CORRECTED, SO THAT LIGHT OF AT LEAST TWO SELECTED WAVELENGTHS IS FOCUSSED AT A SINGLE AXIAL POINT.

ACOUSTOOPTIC

PERTAINING TO THE INTERACTION OF OPTICAL AND ACOUSTIC WAVES. SEE ALSO:

ACOUSTOOPTIC EFFECT.

ACOUSTOOPTIC EFFECT

THE CHANGES IN DIFFRACTION PATTERNS OR PHASE GRATINGS PRODUCED IN A MEDIUM CONDUCTING A LIGHTWAVE WHEN THE MEDIUM IS SUBJECTED TO A SOUND (ACOUSTIC) WAVE. DUE TO THE PHOTOELASTIC CHANGES THAT OCCUR. NOTE: THE ACOUSTIC WAVES MIGHT BE CREATED BY A FORCE DEVELOPED BY AN IMPINGING SOUND WAVE. THE PIEZO ELECTRIC EFFECT. OR MAGNETOSTRICTION. THE EFFECT CAN BE USED TO MODULATE A LIGHT BEAM IN A MATERIAL SINCE MANY PROPERTIES. SUCH AS LIGHT CONDUCTING VELOCITIES. REFLECTION AND TRANSMISSION COEFFICIENTS AT INTERFACES. ACCEPTANCE ANGLES. CRITICAL ANGLES. AND TRANSMISSION MODES. ARE DEPENDENT UPON THE DIFFRACTIVE CHANGES THAT OCCUR. SEE ALSO: ACCOUSTOOPTIC.

ACTIVATED CHEMICAL VAPOR DEPOSITION PROCESS (PACVD)

SEE: PLASMA-ACTIVATED CHEMICAL VAPOR DEPOSITION PROCESS (PACVD).

ACTIVE LASER MEDIUM

THE MATERIAL. SUCH AS CRYSTAL. GAS. GLASS. LIQUID. OR SEMICONDUCTOR. THAT ACTUALLY LASES. THAT IS. IS ABLE TO FUNCTION AS A SOURCE OF HIGH-INTENSITY RELATIVELY MONOCHROMATIC COHERENT LIGHT WHEN ACTIVATED. I.E. CAUSED TO EMIT WHEN RESONATED WITH PUMPED OR OSCILLATORY ENERGY. SYNONYM: LASER MEDIUM; LASING MEDIUM; ACTIVE MATERIAL.

ACTIVE MATERIAL

SEE: ACTIVE LASER MEDIUM.

ACTIVE OPTICS

PERTAINING TO THE DEVELOPMENT AND USE OF OPTICAL COMPONENTS WHOSE CHARACTERISTICS ARE CONTROLLED DURING THEIR OPERATIONAL USE IN ORDER TO MODIFY CHARACTERISTICS. SUCH AS WAVE FRONT DIRECTION. POLARIZATION. MODE. INTENSITY. OR PATH. OF AN ELECTROMAGNETIC WAVE IN THE VISIBLE OR NEAR VISIBLE REGION OF THE FREQUENCY SPECTRUM; IN CONTRAST TO INACTIVE. RIGID. OR FIXED OPTICS IN WHICH COMPONENTS ARE NOT VARIED. WITH PRIMARY ATTENTION BEING GIVEN TO MEASUREMENT AND CONTROL OF WAVEFRONTS OR RAYS IN REAL TIME IN ORDER TO CONCENTRATE RADIATED ENERGY ON A DETECTOR. TARGET. WAVEGUIDE. OR OTHER DEVICE.

ADAPTATION

SEE: DARK ADAPTATION; LIGHT ADAPTATION.

ADAPTIVE TECHNIQUE

SEE: COHERENT OPTICAL ADAPTIVE TECHNIQUE.

ADP COUPLER

SEE: AVALANCHE PHOTODIODE COUPLER.

AIR-SPACED DOUBLET

IN OPTICS. A COMPOUND LENS OF TWO ELEMENTS WITH AIR OR EMPTY SPACE BETWEEN THEM.

ALIGNED BUNDLE
SEE: COHERENT BUNDLE.

ALUMINUM GARNET SOURCE
SEE: YAG/LED SOURCE.

AMPLIFICATION BY STIMULATED EMISSION OF RADIATION
SEE: MICROWAVE AMPLIFICATION BY STIMULATED EMISSION OF RADIATION.

ANALOG-INTENSITY MODULATION
IN AN OPTICAL MODULATOR, THE VARIATION OF THE INTENSITY, I.E. INSTANTANEOUS OUTPUT POWER LEVEL, OF A LIGHT SOURCE IN ACCORDANCE WITH AN INTELLIGENCE-BEARING SIGNAL OR CONTINUOUS WAVE, THE RESULTING ENVELOP NORMALLY BEING DETECTABLE AT THE OTHER END OF A LIGHT-WAVE TRANSMISSION SYSTEM.

ANALYZER
SEE: LIGHT ANALYZER

ANAMORPHIC
IN OPTICAL SYSTEMS, PERTAINING TO A CONFIGURATION OF OPTICAL COMPONENTS, SUCH AS LENSES, MIRRORS, AND PRISMS, THAT PRODUCE DIFFERENT EFFECTS ON AN IMAGE IN DIFFERENT DIRECTIONS OR DIFFERENT EFFECTS ON DIFFERENT PARTS, FOR EXAMPLE PRODUCING DIFFERENT MAGNIFICATION IN DIFFERENT DIRECTIONS OR CONVERTING A POINT ON AN OBJECT TO A LINE ON ITS IMAGE.

ANGLE
SEE: ACCEPTANCE ANGLE; BREWSTER ANGLE; CONVERGENCE ANGLE; CRITICAL ANGLE; DEVIATION ANGLE; EXIT ANGLE; LAUNCH ANGLE; LIMITING RESOLUTION ANGLE; MAXIMUM ACCEPTANCE ANGLE; REFLECTION ANGLE; REFRACTION ANGLE.

ANGLE-BETWEEN-HALF-POWER-POINTS
SEE: EMISSION BEAM ANGLE BETWEEN HALF-POWER POINTS.

ANGULAR MAGNIFICATION
THE RATIO OF THE APPARENT SIZE OF AN IMAGE SEEN THROUGH AN OPTICAL ELEMENT OR INSTRUMENT TO THAT OF THE OBJECT VIEWED BY THE UNAIDED EYE, WHEN BOTH THE OBJECT AND IMAGE ARE AT INFINITY, WHICH IS THE CASE FOR TELESCOPES, OR WHEN BOTH THE OBJECT AND IMAGE ARE CONSIDERED TO BE AT THE DISTANCE OF DISTINCT VISION, WHICH IS THE CASE FOR MICROSCOPES. SYNONYM: MAGNIFYING POWER.

ANGULAR MISALIGNMENT LOSS
IN AN OPTICAL FIBER, SIGNAL POWER LOSS AT THE JUNCTION OF TWO FIBERS THAT ARE NOT BUTT-JOINED IN A STRAIGHT LINE, I.E. WHEN THERE IS AN ANGULAR DISPLACEMENT BETWEEN THE OPTICAL AXES OF THE TWO FIBERS. NOTE: THE ANGULAR MISALIGNMENT LOSS IS USUALLY EXPRESSED IN DECIBELS (DB).

ANISOTROPIC

PERTAINING TO A MATERIAL WHOSE CHARACTERISTICS OR PARAMETERS, SUCH AS MAGNETIC PERMEABILITY, ELECTRIC PERMITTIVITY, INDEX OF REFRACTION, ELECTRIC CONDUCTIVITY, OR TENSILE STRENGTH ARE DIFFERENT IN DIFFERENT DIRECTIONS. THUS, FOR EXAMPLE, TWO IDENTICAL LIGHT BEAMS PROPAGATING THROUGH AN ANISOTROPIC MATERIAL IN DIFFERENT DIRECTIONS WILL BE AFFECTED IN DIFFERENT MANNERS.

ANTENNA

SEE: LIGHT ANTENNA.

ANTIREFLECTION COATING

A CLASS OF SINGLE OR MULTILAYER COATINGS THAT ARE APPLIED TO A SURFACE OR SURFACES OF A SUBSTRATE FOR THE PURPOSE OF DECREASING THE REFLECTANCE OF THE SURFACE AND INCREASING THE TRANSMISSION OF THE SUBSTRATE OVER A SPECIFIED WAVELENGTH RANGE.

APD

SEE: AVALANCHE PHOTODIODE.

APERTURE

IN AN OPTICAL SYSTEM, AN OPENING OR HOLE, THROUGH WHICH LIGHT OR MATTER MAY PASS THAT IS EQUAL TO THE DIAMETER OF THE LARGEST ENTERING BEAM OF LIGHT THAT CAN TRAVEL COMPLETELY THROUGH THE SYSTEM AND THAT MAY OR MAY NOT BE EQUAL TO THE APERTURE OF THE OBJECTIVE. SEE: NUMERICAL APERTURE.

APERTURE RATIO

THE VALUE R(A) IN THE EQUATION, $R(A) = 2N \sin A$, WHERE N IS THE REFRACTIVE INDEX OF THE IMAGE SPACE, AND A IS THE MAXIMUM ANGULAR OPENING OF THE AXIAL BUNDLE OF REFRACTED RAYS. NOTE: THE SPEED, I.E., ENERGY PER UNIT AREA OF IMAGES, OF AN OBJECTIVE IS PROPORTIONAL TO THE SQUARE OF ITS APERTURE RATIO. WHEN THE ANGULAR OPENING IS SMALL, WHEN $N = 1$, AND WHEN THE OBJECT DISTANCE IS GREAT, IT IS APPROXIMATELY TRUE THAT $N \sin A = D/2F$, OR THAT F/D = F-NUMBER = $1/2R(A) = 1/$APERTURE RATIO.

APERTURE STOP

THE PHYSICAL DIAMETER THAT LIMITS THE SIZE OF THE CONE OF RADIATION THAT AN OPTICAL SYSTEM WILL ACCEPT FROM AN AXIAL POINT ON AN OBJECT.

APLANATIC LENS

A LENS THAT HAS BEEN CORRECTED FOR SPHERICAL ABERRATION, DEPARTURE FROM THE SINE CONDITION, COMA, AND COLOR.

ARTIFICIAL PUPIL

A DIAPHRAGM, OR OTHER LIMITATION, THAT CONFINES A BEAM OF LIGHT TO A SMALLER CONE, FOR EXAMPLE A PUPIL THAT CONFINES A BEAM OF LIGHT ENTERING THE EYE TO A SMALLER CONE THAN DOES THE IRIS OF THE HUMAN EYE.

ASPECT

SEE: IMAGE ASPECT.

ASSEMBLY

SEE: CABLE ASSEMBLY; MULTIPLE-BUNDLE CABLE ASSEMBLY; MULTIPLE-FIBER CABLE ASSEMBLY; OPTICAL HARNESS ASSEMBLY.

ASTIGMATISM

AN ABERRATION OF A LENS OR LENS SYSTEM THAT CAUSES AN OFF-AXIS POINT TO BE IMAGED AS TWO SEPARATED LINES PERPENDICULAR TO EACH OTHER.

ATMOSPHERE LASER

SEE: LONGITUDINALLY-EXCITED ATMOSPHERE LASER; TRANSVERSE-EXCITED ATMOSPHERE LASER.

ATOMIC DEFECT ABSORPTION

IN LIGHTWAVE TRANSMISSION MEDIA, SUCH AS OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS MADE OF GLASS, SILICA, PLASTIC AND OTHER MATERIALS, THE ABSORPTION OF LIGHT ENERGY FROM A TRAVELLING OR STANDING WAVE BY ATOMIC CHANGES, BROUGHT ABOUT DURING OR AFTER PRODUCTION, BY EXPOSURE TO RADIATION, SUCH AS INFRARED OR GAMMA RADIATION AT HIGH LEVELS. FOR EXAMPLE TITANIUM DOPED SILICA CAN DEVELOP LOSSES OF SEVERAL THOUSAND DB/KILOMETER WHEN THE FIBERS ARE DRAWN UNDER HIGH TEMPERATURE, AND CONVENTIONAL FIBER OPTIC GLASSES CAN DEVELOP LOSSES OF 20,000 DB/KILOMETER DURING AND AFTER EXPOSURE TO GAMMA RADIATION OF 3,000 RADS.

ATTENUATION

SEE: OPTICAL DISPERSION ATTENUATION.

ATTENUATION TERM

IN THE PROPAGATION OF AN ELECTROMAGNETIC WAVE IN A WAVEGUIDE, SUCH AS AN OPTICAL FIBER, THIN FILM, OR METAL PIPE, THE TERM, A, IN THE EXPRESSION FOR THE EXPONENTIAL VARIATION CHARACTERISTIC OF GUIDED WAVES, EXP(-PZ) = EXP (-IHZ-AZ), THAT REPRESENTS THE ATTENUATION OR PULSE AMPLITUDE DIMINUTION EXPERIENCED PER UNIT OF PROPAGATION DISTANCE OF THE WAVE. NOTE: IN A GIVEN GUIDE, THE PHASE TERM, H, IS INITIALLY ASSUMED TO BE INDEPENDENT OF THE ATTENUATION TERM, A, WHICH IS THEN FOUND SEPARATELY, ASSUMING H DOES NOT CHANGE WITH LOSSES. FOR AN OPTICAL FIBER, THE ATTENUATION TERM, A, IS SUPPLIED BY THE MANUFACTURER SINCE IT CAN BE EXPERIMENTALLY MEASURED. SEE ALSO: PHASE TERM; PROPAGATION CONSTANT.

ATTENUATOR

SEE: CONTINUOUS VARIABLE OPTICAL ATTENUATOR; FIXED OPTICAL ATTENUATOR; OPTICAL ATTENUATOR; STEPWISE VARIABLE OPTICAL ATTENUATOR.

AVALANCHE PHOTODIODE (APD)

A PHOTO-DETECTING DIODE THAT IS SENSITIVE TO INCIDENT PHOTO ENERGY BY INCREASING ITS CONDUCTIVITY BY EXPONENTIALLY INCREASING THE NUMBER OF ELECTRONS IN ITS CONDUCTION BAND ENERGY LEVELS THROUGH THE ABSORPTION OF THE PHOTONS OF ENERGY, ELECTRON INTERACTION, AND AN APPLIED BIAS VOLTAGE. NOTE: THE PHOTODIODE IS DESIGNED TO TAKE ADVANTAGE OF AVALANCHE MULTIPLICATION OF PHOTOCURRENT. AS THE REVERSE-BIAS VOLTAGE APPROACHES THE BREAKDOWN VOLTAGE, HOLE-ELECTRON PAIRS CREATED BY ABSORBED PHOTONS ACQUIRE SUFFICIENT ENERGY TO

CREATE ADDITIONAL HOLE-ELECTRON PAIRS WHEN THEY COLLIDE WITH SUBSTRATE ATOMS: THUS A MULTIPLICATION EFFECT IS ACHIEVED.

AVALANCHE PHOTODIODE COUPLER

A COUPLING DEVICE THAT ENABLES THE COUPLING OF LIGHT ENERGY FROM AN OPTICAL FIBER ONTO THE PHOTO SENSITIVE SURFACE OF AN AVALANCHE PHOTODIODE (ADP) OF A PHOTON DETECTOR (PHOTODETECTOR) AT THE RECEIVING END OF AN OPTICAL FIBER DATA LINK. NOTE: THE COUPLER MAY BE ONLY A FIBER PIGTAIL EPOXIED TO THE APD. SYNONYM: APD COUPLER.

AVERAGE POWER

IN A PULSED LASER, THE ENERGY PER PULSE (JOULES) TIMES THE PULSE REPETITION RATE (HERTZ), USUALLY EXPRESSED IN WATTS.

AVPO

SEE: AXIAL VAPOR-PHASE OXIDATION PROCESS.

AXIAL BUNDLE

A CONE OF ELECTROMAGNETIC RAYS, SUCH AS LIGHT RAYS, THAT EMANATE FROM AN OBJECT POINT THAT IS LOCATED ON THE OPTICAL AXIS OF A LENS SYSTEM.

AXIAL VAPOR-PHASE OXIDATION PROCESS (AVPO)

A VAPOR-PHASE OXIDATION (VPO) PROCESS FOR MAKING GRADED-INDEX (GI) OPTICAL FIBERS IN WHICH THE GLASS PREFORM IS GROWN RADIALLY RATHER THAN LONGITUDINALLY AS IN OTHER PROCESSES, THE REFRACTIVE INDEX THUS BEING CONTROLLED IN A SPATIAL DOMAIN RATHER THAN A TIME DOMAIN, AND THE CHEMICAL GASES ARE BURNED IN AN OXYHYDROGEN FLAME, AS IN THE OVPO PROCESS, TO PRODUCE A STREAM OF SOOT PARTICLES TO PRODUCE THE GRADED INDEX OF REFRACTION.

AXIS

SEE: OPTICAL AXIS.

AXIS PARABOLOIDAL MIRROR

SEE: OFF-AXIS PARABOLODIAL MIRROR.

B

BACK FOCAL LENGTH (BFL)

THE DISTANCE MEASURED FROM THE VERTEX OF THE BACK SURFACE OF A LENS TO ITS REAR FOCAL POINT.

BACK-SURFACE MIRROR

AN OPTICAL MIRROR ON WHICH THE REFLECTING SURFACE IS APPLIED TO THE BACK SURFACE OF THE MIRROR, I.E. NOT TO THE SURFACE OF FIRST INCIDENCE. NOTE: THE REFLECTED LIGHT MUST PASS THROUGH THE SUBSTRATE TWICE, ONCE AS PART OF THE INCIDENT LIGHT AND ONCE AS THE REFLECTED LIGHT. SEE ALSO: FRONT-SURFACE MIRROR.

BALSAM

SEE: CANADA BALSAM

BAND

SEE: CONDUCTION BAND; INFRARED BAND; VALENCE BAND.

BANDWIDTH

SEE: SPECTRAL BANDWIDTH

BANDWIDTH PRODUCT

SEE: GAIN-BANDWIDTH PRODUCT.

BARRIER-LAYER CELL

SEE: PHOTOVOLTAIC CELL.

BASIC MODE

SEE: LASER BASIC MODE.

BEAM

A SHAFT OR COLUMN OF ELECTROMAGNETIC RADIATION, SUCH AS RADIO WAVES OR LIGHT OR A BUNDLE OF RAYS, CONSISTING OF PARALLEL, CONVERGING, OR DIVERGING RAYS. SEE: DIVERGING BEAM.

BEAM-ANGLE-BETWEEN-HALF-POWER-POINTS

SEE: EMISSION BEAM-ANGLE-BETWEEN-HALF-POWER-POINTS.

BEAM DIAMETER

IN AN ELECTROMAGNETIC BEAM, SUCH AS A LIGHT BEAM, THE LATERAL DISTANCE BETWEEN THE TWO POINTS AT WHICH THE POWER DENSITY OR ENERGY DENSITY IS A SPECIFIED FRACTION, TYPICALLY 1/2, 1/E SQUARED OR 1/10, OF THE PEAK DENSITY. SEE ALSO: BEAM WIDTH.

BEAM DIVERGENCE

IN AN ELECTROMAGNETIC BEAM, SUCH AS A LIGHT BEAM, THE INCREASE IN BEAM DIAMETER WITH INCREASE IN DISTANCE FROM THE SOURCE SUCH AS A LASER'S EXIT APERTURE. NOTE: THE DIVERGENCE, USUALLY EXPRESSED IN MILLIRADIANS, IS MEASURED AT SPECIFIED POINTS, WHERE POWER DENSITY OR ENERGY DENSITY IS 1/2 OR 1/E OF THE MAXIMUM VALUE. IT CAN BE SPECIFIED AS A HALF-ANGLE OR A FULL-ANGLE OF DIVERGENCE.

BEAMSPLITTER

AN OPTICAL DEVICE FOR DIVIDING A LIGHT BEAM INTO TWO SEPARATED BEAMS. NOTE: A SIMPLE BEAMSPLITTER MAY BE A PLANE PARALLEL PLATE, WITH ONE SURFACE COATED WITH A DIELECTRIC OR METALLIC COATING THAT REFLECTS A PORTION AND TRANSMITS A PORTION OF THE INCIDENT BEAM: I.E., PART OF THE LIGHT IS DEVIATED THROUGH AN ANGLE OF 90° AND PART IS UNCHANGED IN DIRECTION. A BEAMSPLITTER MAY BE MADE BY COATING THE HYPOTENUSE FACE OF ONE OF TWO 45-90 DEGREE PRISMS AND CEMENTING THE HYPOTENUSE FACES TOGETHER. THE THICKNESS OF THE METALLIC BEAMSPLITTING INTERFACE WILL DETERMINE THE PROPORTIONS OF THE LIGHT REFLECTED AND TRANSMITTED. IN METALLIC BEAMSPLITTERS, AN APPRECIABLE AMOUNT OF LIGHT IS LOST BY ABSORPTION IN THE METAL. IT MAY ALSO BE NECESSARY TO MATCH THE REFLECTED AND TRANSMITTED BEAM FOR BRIGHTNESS AND FOR COLOR. IN THESE CASES IT WILL BE NECESSARY TO USE A MATERIAL AT THE INTERFACE THAT GIVES THE SAME COLOR OF LIGHT BY TRANSMISSION AND REFLECTION. WHERE COLOR MATCHING AT THE SURFACE OR INTERFACE CANNOT BE ACCOMPLISHED, A CORRECTING COLOR FILTER MAY BE PLACED IN ONE OF THE BEAMS.

BEAMWIDTH

THE ANGULAR DIFFERENCE BETWEEN THE DIRECTION IN WHICH RADIANT POWER DENSITY IS A PRESCRIBED FRACTION OF THE PEAK DENSITY, THE FRACTION OFTEN BEING EXPRESSED AS 1/2, 1/E, 1/E SQUARED, OR 1/10 OF THE PEAK POWER DENSITY.

BEER'S LAW

IN THE TRANSMISSION OF ELECTROMAGNETIC RADIATION THROUGH A LIQUID SOLUTION (NON-ABSORBING NON-SCATTERING SOLVENT CONTAINING AN ABSORBING OR SCATTERING SOLUTE), THE ATTENUATION, REDUCTION, DECAY, OR DIMINUTION OF ELECTROMAGNETIC FIELD INTENSITY OR POWER DENSITY IS AN EXPONENTIAL DECAY FUNCTION OF THE PRODUCT OF THE CONCENTRATION OF THE SOLUTE, C, THE SPECTRAL ABSORPTION/SCATTERING COEFFICIENT PER UNIT OF CONCENTRATION PER UNIT OF DISTANCE, A, AND THE THICKNESS, X, GIVEN BY THE RELATIONSHIP I = I(O) EXP-CAX, WHERE I IS THE POWER DENSITY AT DISTANCE X AND I (O) IS THE POWER DENSITY AT X=O. SEE ALSO: BOUGER'S LAW; LAMBERT'S LAW.

BER

SEE: BIT ERROR RATE.

BFL

SEE: BACK FOCAL LENGTH.

BIFOCAL

IN OPTICS, PERTAINING TO A SYSTEM OR COMPONENT, SUCH AS A LENS OR LENS SYSTEM, THAT HAS, OR IS CHARACTERIZED BY, TWO OR MORE OPTICAL FOCI.

BIREFRINGENCE

THE SPLITTING OF A LIGHT BEAM INTO TWO DIVERGENT COMPONENTS UPON PASSAGE THROUGH A DOUBLY REFRACTING MEDIUM, THE TWO COMPONENTS TRAVELLING AT DIFFERENT VELOCITIES IN THE MEDIUM.

BIT ERROR RATE (BER)

IN THE TRANSMISSION OF A SEQUENCE, SINGLE STREAM, OR PARALLEL STREAM OF BINARY DIGITS, IN ANY WIRE, LINE, CHANNEL, CIRCUIT, TRUNK OR OTHER PATH,

THE NUMBER OF BITS THAT ARE IN ERROR AT ONE POINT DIVIDED BY THE TOTAL NUMBER OF BITS TRANSMITTED AT ANOTHER POINT, USUALLY EXPRESSED AS THE ERRONEOUS BITS PER MILLION, BETWEEN THE SPECIFIED POINTS.

BITORIC LENS

A LENS BOTH SURFACES OF WHICH ARE GROUND AND POLISHED IN A CYLINDRICAL FORM OR IN A TOROIDAL SHAPE.

BIT-RATE-LENGTH PRODUCT

FOR AN OPTICAL FIBER OR CABLE, THE PRODUCT OF BIT RATE THE FIBER OR CABLE IS ABLE TO HANDLE AND THE LENGTH FOR TOLERABLE DISPERSION AT THE BIT RATE. THE PRODUCT USUALLY STATED IN UNITS OF MEGABITS - KM/SECOND. NOTE: TYPICAL BIT-RATE-LENGTH PRODUCTS FOR GRADED INDEX FIBERS WITH A NUMERICAL APERTURE (NA) OF 0.2 IS 1000 MB-KM/SEC FOR RESEARCH FIBERS AND 200 MB-KM/SEC FOR PRODUCTION FIBERS; PLASTIC CLAD FIBERS WITH AN NA OF 0.25 ARE 30 MB-KM/SEC FOR BOTH RESEARCH AND PRODUCTION FIBERS. THE PRODUCT IS A GOOD MEASURE OF FIBER PERFORMANCE IN TERMS OF TRANSMISSION CAPABILITY.

BLACK BODY

AN IDEAL BODY THAT WOULD ABSORB ALL RADIATION INCIDENT ON IT. WHEN HEATED BY EXTERNAL MEANS THE SPECTRAL ENERGY DISTRIBUTION OF RADIATED ENERGY WOULD FOLLOW CURVES SHOWN ON OPTICAL SPECTRUM CHARTS. NOTE: THE IDEAL BLACKBODY IS A PERFECTLY ABSORBING BODY. IT REFLECTS NONE OF THE ENERGY THAT MAY BE INCIDENT UPON IT. IT RADIATES (PERFECTLY) AT A RATE EXPRESSED BY THE STEFAN-BOLTZMANN LAW AND THE SPECTRAL DISTRIBUTION OF RADIATION IS EXPRESSED BY PLANCK'S RADIATION FORMULA. WHEN IN THERMAL EQUILIBRIUM, AN IDEAL BLACKBODY ABSORBS PERFECTLY AND RADIATES PERFECTLY AT THE SAME RATE. THE RADIATION WILL BE JUST EQUAL TO ABSORPTION IF THERMAL EQUILIBRIUM IS TO BE MAINTAINED. SYNONYM: IDEAL BLACKBODY.

BLACKNOISE

IN A SPECTRUM OF ELECTROMAGNETIC WAVE FREQUENCIES, A FREQUENCY SPECTRUM OF PREDOMINANTLY ZERO POWER LEVEL AT ALL FREQUENCIES EXCEPT FOR A FEW NARROW BANDS OR SPIKES, SUCH AS MIGHT BE OBTAINED WHEN SCANNING A BLACK AREA IN FACSIMILE TRANSMISSION SYSTEMS AND THERE ARE A FEW WHITE SPOTS OR SPECKLES ON THE SURFACE.

BLEMISH

AN AREA, IN A FIBER OR FIBER BUNDLE, THAT HAS A REDUCED LIGHT TRANSMISSION CAPABILITY, I.E. INCREASED ATTENUATION, DUE TO DEFECTIVE OR BROKEN FIBERS, FOREIGN SUBSTANCES, OR OTHER SPOILAGE.

BLOCKING CEMENT

AN ADHESIVE USED TO BOND OPTICAL ELEMENTS TO BLOCKING TOOLS. NOTE: IT IS USUALLY A THERMOPLASTIC MATERIAL SUCH AS RESIN, BEESWAX, PITCH, OR SHELLAC.

BLUE NOISE

IN A SPECTRUM OF ELECTROMAGNETIC WAVE FREQUENCIES, A REGION IN WHICH THE SPECTRAL DENSITY IS PROPORTIONAL TO THE FREQUENCY (SLOPED), RATHER THAN INDEPENDENT OF FREQUENCY (FLAT), AS IN WHITE NOISE THAT IS MORE OF A UNIFORMLY DISTRIBUTED CONSTANT AMPLITUDE FREQUENCY SPECTRUM.

BODY

SEE: BLACKBODY.

BOLOMETER

AN ELECTRICAL INSTRUMENT FOR MEASURING RADIANT ENERGY BY MEASURING THE CHANGES IN RESISTANCE OF A BLACKENED TEMPERATURE-SENSITIVE DEVICE EXPOSED TO THE RADIATIONS.

BOLTZMANN'S CONSTANT (K)

1.38 X 10 - 23 POWER JOULES/KELVIN. NOTE: THE CONSTANT IS OFTEN DESIGNATED BY A LOWER-CASE K, IN CONTRAST TO AN UPPER-CASE K, WHICH DESIGNATES KELVIN.

BOUGER'S LAW

IN THE TRANSMISSION OF ELECTROMAGNETIC RADIATION THROUGH A MATERIAL MEDIUM, THE ATTENUATION, REDUCTION, DECAY, OR DIMINUTION OF ELECTROMAGNETIC FIELD INTENSITY OR POWER DENSITY IS AN EXPONENTIAL DECAY FUNCTION OF THE PRODUCT OF A CONSTANT COEFFICIENT, DEPENDENT UPON THE MATERIAL, AND THE THICKNESS, GIVEN BY THE RELATIONSHIP I = I(O)EXP NEG AX, WHERE I IS THE INTENSITY AT DISTANCE X, I(O) IS THE INTENSITY AT X=O, AND A IS A MATERIAL CONSTANT COEFFICIENT THAT DEPENDS UPON THE SCATTERING AND ABSORPTIVE PROPERTIES OF THE MEDIUM. IF ONLY ABSORPTION TAKES PLACE, A IS THE SPECTRAL ABSORPTION COEFFICIENT AND IS A FUNCTION OF WAVELENGTH; IF ONLY SCATTERING TAKES PLACE, IT IS THE SCATTERING COEFFICIENT; IF BOTH ABSORPTION AND SCATTERING OCCUR, IT IS THE EXTINCTION COEFFICIENT, BEING THEN THE SUM OF THE ABSORPTION AND SCATTERING COEFFICIENTS. SEE ALSO: BEER'S LAW; LAMBERT'S LAW.

BOULE

AN ASSEMBLY OF FUSED FIBERS FROM WHICH FIBER FACEPLATES MAY BE SLICED. SEE ALSO: FIBER FACEPLATE.

BOUNDARY-LAYER PHOTOCELL

SEE: PHOTOVOLTAIC CELL.

BRANCH

IN A MULTICONDUCTOR CABLE, SUCH AS A CABLE CONSISTING OF TWO OR MORE OPTICAL FIBERS OR WIRES, THE PORTION THAT BREAKS OUT OR DEPARTS FROM THE REMAINING CONDUCTORS.

BRANCHED CABLE

A MULTIPLE-WIRE, MULTIPLE-FIBER, OR MULTIPLE-BUNDLE CABLE THAT CONTAINS ONE OR MORE BREAKOUTS, DIVERGENCES, I.E. BRANCHES.

BREAKOUT POINT

THE POINT WHERE A BRANCH MEETS, MERGES, OR JOINS WITH OR DIVERGES FROM THE MAIN CABLE OR HARNESS RUN. NOTE: THE CONVERGENCE OR DIVERGENCE IS THE BREAKOUT POINT OF THE FIBER.

BREWSTER ANGLE

THE ANGLE WITH THE NORMAL AT WHICH AN ELECTROMAGNETIC WAVE INCIDENT UPON AN INTERFACE SURFACE BETWEEN TWO DIELECTRIC MEDIA OF DIFFERENT INDICES OF REFRACTION, WITH THE MAGNETIC COMPONENT OF THE WAVE PARALLEL TO THE INTERFACE, IS TOTALLY TRANSMITTED INTO THE SECOND MEDIUM.
NOTE: FOR MOST DIELECTRICS, THE BREWSTER ANGLE IS GIVEN BY:
TAN B = SQUARE ROOT E(2)/E(1), WHERE B IS THE BREWSTER ANGLE, E(1) IS THE ELECTRIC PERMITTIVITY OF THE INCIDENT MEDIUM, AND E(2) IS THE ELECTRIC PERMITTIVITY OF THE TRANSMITTED MEDIUM. THE BREWSTER ANGLE IS A CONVENIENT ANGLE TO TRANSMIT ALL THE ENERGY IN AN OPTICAL FIBER TO AN OUTSIDE DETECTOR. THERE IS NO BREWSTER ANGLE, FOR WHICH THERE IS TOTAL TRANSMISSION AND THEREFORE ZERO REFLECTION, WHEN THE ELECTRIC FIELD COMPONENT IS PARALLEL TO THE INTERFACE, EXCEPT WHEN THE PERMITTIVITIES ARE EQUAL, IN WHICH CASE THERE IS NO INTERFACE. ALSO, FOR ENTRY INTO A MORE DENSE MEDIUM, SUCH AS FROM AIR INTO AN OPTICAL FIBER, TAN B = N(2)/N(1) AND FROM A MORE DENSE MEDIUM INTO A LESS DENSE MEDIUM, SUCH AS FIBER TO AIR, TAN B = N(1)/N(2) WHERE N(1) AND N(2) ARE THE INDICES OF REFRACTION OF THE AIR AND FIBER, RESPECTIVELY.

BREWSTER'S LAW

WHEN AN ELECTROMAGNETIC WAVE IS INCIDENT UPON A SURFACE, AND THE ANGLE BETWEEN THE REFRACTED AND REFLECTED RAY IS 90*, MAXIMUM POLARIZATION OCCURS IN BOTH RAYS, THE REFLECTED RAY HAVING ITS MAXIMUM POLARIZATION IN A DIRECTION NORMAL TO THE PLANE OF INCIDENCE, AND THE REFRACTED RAY HAVING ITS MAXIMUM POLARIZATION IN THE PLANE OF INCIDENCE.

BRIGHTNESS

AN ATTRIBUTE OR VISUAL PERCEPTION IN ACCORDANCE WITH WHICH A SOURCE APPEARS TO EMIT MORE OR LESS LIGHT. NOTE: SINCE THE EYE IS NOT EQUALLY SENSITIVE TO ALL COLORS, BRIGHTNESS CANNOT BE A QUANTITATIVE TERM. IT IS USED IN NONQUANTITATIVE STATEMENTS WITH REFERENCE TO SENSATIONS AND PERCEPTIONS OF LIGHT.

SEE: IMAGE BRIGHTNESS.

BRIGHTNESS CONSERVATION

SEE: RADIANCE CONSERVATION.

BUFFER

SEE: FIBER BUFFER.

BULK MATERIAL ABSORPTION

IN FIBER OPTICS, THE LIGHTWAVE POWER ABSORPTION THAT OCCURS PER UNIT VOLUME OF THE BASIC MATERIAL USED TO FORM AN OPTICAL FIBER EITHER CORE, CLADDING OR JACKET. NOTE: MEASUREMENT IS MADE OF BULK MATERIAL ABSORPTION PRIOR TO USE IN FORMING OPTICAL WAVEGUIDES. ABSORPTION IS USUALLY EXPRESSED IN DB/KM, I.E. AS AN ATTENUATION.

BULK MATERIAL SCATTERING

IN FIBER OPTICS, THE LIGHTWAVE PER UNIT POWER THAT IS SCATTERED PER UNIT VOLUME OF THE BASIC MATERIAL USED TO FORM AN OPTICAL FIBER, EITHER CORE, CLADDING OR JACKET. NOTE: MEASUREMENT IS MADE OF BULK MATERIAL SCATTERING PRIOR TO USE IN FORMING OPTICAL WAVEGUIDES. SCATTERING FOLLOWS

A RAYLEIGH DISTRIBUTION, CHARACTERISTIC OF A MEDIUM WHOSE REFRACTIVE INDEX FLUCTUATES OVER SMALL DISTANCES COMPARED TO THE WAVELENGTH OF THE INCIDENT LIGHT. SCATTERING LOSSES ARE USUALLY EXPRESSED IN DB/KM.

BUNDLE

A GROUP OF CONDUCTORS, SUCH AS WIRES, OPTICAL FIBERS, OR CO-AXIAL CABLES ASSOCIATED TOGETHER, AND USUALLY IN A SINGLE SHEATH. NOTE: OFFICIAL FIBER BUNDLES ARE USUALLY CONSIDERED TO BE IN A RANDOM ARRANGEMENT AND ARE USED OR CONSIDERED AS A SINGLE TRANSMISSION MEDIUM. SEE: AXIAL BUNDLE; COHERENT BUNDLE; OPTICAL FIBER BUNDLE; NONCOHERENT BUNDLE.

BUNDLE CABLE

SEE: MULTIPLE-BUNDLE CABLE; MULTI-CHANNEL BUNDLE CABLE; SINGLE-CHANNEL SINGLE-BUNDLE CABLE.

BUNDLE CABLE ASSEMBLY

SEE: MULTIPLE-BUNDLE CABLE ASSEMBLY.

BUNDLE JACKET

THE OUTER PROTECTIVE COVERING APPLIED OVER A BUNDLE OF OPTICAL FIBERS. SEE ALSO: CLADDING.

BUNDLE RESOLVING POWER

THE ABILITY OF A COHERENT OPTICAL FIBER BUNDLE TO TRANSMIT THE DETAILS OF AN IMAGE, USUALLY STATED IN LINES PER MILLIMETER.

BURRUS LED

SEE: SURFACE-EMITTING LED.

BUS

SEE: DATA BUS.

BUS COUPLER

SEE: DATA-BUS COUPLER.

C

CABLE

A JACKETED BUNDLE OR JACKETED FIBER, IN A FORM THAT CAN BE TERMINATED. SEE: BRANCHED CABLE; FIBER-OPTIC CABLE; MULTI-CHANNEL BUNDLE CABLE; MULTI-CHANNEL CABLE; MULTI-CHANNEL SINGLE-FIBER CABLE; MULTIPLE-BUNDLE CABLE;

MULTIPLE-FIBER CABLE; SINGLE-CHANNEL SINGLE-BUNDLE CABLE; SINGLE-CHANNEL SINGLE-FIBER CABLE.
SEE: CENTRAL STRENGTH-MEMBER OPTICAL CABLE; PERIPHERAL STRENGTH-MEMBER OPTICAL CABLE.

CABLE ASSEMBLY
A CABLE TERMINATED AND READY FOR INSTALLATION. SEE: MULTIPLE BUNDLE CABLE ASSEMBLY; MULTIPLE-FIBER CABLE ASSEMBLY.

CABLE CORE
THE PORTION OF A CABLE INSIDE OF A COMMON COVERING.

CABLE JACKET
THE OUTER PROTECTIVE COVERING APPLIED OVER THE INTERNAL CABLE ELEMENTS.

CABLE RUN
THE PORTION OF A BRANCHED CABLE OR HARNESS WHERE THE CROSS-SECTIONAL AREA OF THE CABLE OR HARNESS IS THE LARGEST. SYNONYM: HARNESS RUN.

CALSPAR
SEE: ICELAND SPAR.

CANADA BALSAM
AN ADHESIVE USED TO CEMENT OPTICAL ELEMENTS.

CANDELA
THE LUMINOUS INTENSITY OF 1/600,000 OF A SQUARE METER OF A BLACKBODY RADIATOR AT THE TEMPERATURE OF SOLIDIFICATION OF PLANTINUM, 2045 KELVIN. ONE CANDELA EMITS 4 PI LUMENS OF LIGHT FLUX.

CANDLEPOWER
A UNIT OF MEASURE OF THE ILLUMINATING POWER OF ANY LIGHT SOURCE, EQUAL TO THE NUMBER OF CANDLES OF THE SOURCE OF LIGHT. A FLUX DENSITY OF ONE LUMEN OF LUMINOUS FLUX PER STERADIAN OF SOLID ANGLE MEASURED FROM THE SOURCE IS PRODUCED BY A POINT SOURCE OF ONE CANDELA EMITTING EQUALLY IN ALL DIRECTIONS.

CARTESIAN LENS
A LENS, ONE SURFACE OF WHICH IS A CARTESIAN OVAL, THUS PRODUCING AN APLANATIC CONDITION.

CATASTROPHIC DEGRADATION
IN LASER DIODES, THE SUDDEN REDUCTION IN OPTICAL POWER OUTPUT, IN TERMS OF OPTICAL FLUX DENSITY AND PULSE LENGTH, DUE TO FACET FAILURE CAUSED BY INTENSE OPTICAL FIELDS THAT BRING ABOUT LOCAL DISASSOCIATION OF THE MATERIAL, TO THE POINT OF FRACTURING OR CRACKING. NOTE: THE CRITICAL DAMAGE IS MEASURABLE IN WATTS PER CENTIMETER OF FACET. CATASTROPHIC DEGRADATION HAS OCCURRED IN SOLID-STATE (SEMICONDUCTOR) LASERS OF ALL TYPES. SEE ALSO:

GRADUAL DEGRADATION.

CAVITY DIODE
SEE: LARGE OPTICAL-CAVITY DIODE.

CDM
COLOR-DIVISION MULTIPLEXING.

CELL
SEE: KERR CELL; PHOTEMISSIVE CELL; PHOTOVOLTAIC CELL; POCKEL CELL.

CEMENT
IN OPTICS, AN ADHESIVE USED TO BOND OPTICAL ELEMENTS TOGETHER, OR TO BOND OPTICAL ELEMENTS TO HOLDING DEVICES. NOTE: THREE GENERAL TYPES OF CEMENT USED IN THE OPTICAL INDUSTRY ARE BLOCKING CEMENTS; MOUNTING CEMENTS; AND OPTICAL CEMENTS. SEE: BLOCKING CEMENT; MOUNTING CEMENT; OPTICAL CEMENT; THERMOPLASTIC CEMENT; THERMOSETTING CEMENT.

CEMENTED DOUBLET
IN OPTICS, A COMPOUND LENS OF TWO ELEMENTS CEMENTED TOGETHER OVER THEIR CONTIGUOUS SURFACES.

CENTRAL STRENGTH-MEMBER OPTICAL CABLE
A CABLE CONTAINING OPTICAL FIBERS THAT ARE ON THE OUTSIDE OF, OR WRAPPED AROUND, A HIGH TENSILE-STRENGTH MATERIAL, SUCH AS STRANDED STEEL, NYLON, OR OTHER MATERIAL, WITH CRUSH-RESISTANT JACKETING (SHEATHING) ON THE OUTSIDE OF THE CABLE. SEE ALSO: PERIPHERAL STRENGTH-MEMBER OPTICAL CABLE.

CHANNEL BUNDLE CABLE
SEE: MULTI-CHANNEL BUNDLE CABLE.

CHANNEL CABLE
SEE: MULTI-CHANNEL CABLE.

CHANNEL SINGLE-BUNDLE CABLE
SEE: SINGLE-CHANNEL SINGLE-BUNDLE CABLE.

CHANNEL SINGLE-FIBER CABLE
SEE: MULTI-CHANNEL SINGLE-FIBER CABLE.
SEE: SINGLE-CHANNEL SINGLE-FIBER CABLE.

CHARGE
SEE: ELECTRONIC CHARGE.

CHEMICAL VAPOR DEPOSITION PROCESS
SEE: MODIFIED CHEMICAL VAPOR DEPOSITION PROCESS; PLASMA-ACTIVATED

CHEMICAL VAPOR DEPOSITION PROCESS

CHEMICAL VAPOR PHASE OXIDATION PROCESS (CVPO)

A PROCESS FOR THE PRODUCTION OF LOW-LOSS (LESS THAN 10 DB/KM), HIGH BANDWIDTH (GREATER THAN 300 MHZ-KM), MULTIMODE, GRADED INDEX (GI) OPTICAL FIBER, INVOLVING EITHER THE INSIDE VAPOR PHASE OXIDATION (IVPO) PROCESS, THE OUTSIDE VAPOR PHASE OXIDATION (OVPO) PROCESS, THE MODIFIED CHEMICAL VAPOR DEPOSITION (MCVD) PROCESS, THE PLASMA-ACTIVATED CHEMICAL VAPOR DEPOSITION (PCVD) PROCESS, OR THE AXIAL VAPOR PHASE OXIDATION (AVPO) PROCESS, OR A COMBINATION OR VARIATION OF THESE, BY SOOT DEPOSITION ON A GLASS SUBSTRATE FOLLOWED BY OXIDATION AND DRAWING OF THE FIBER. SYNONYM: SOOT PROCESS.

CHICKEN WIRE

AN OPTICAL FIBER BLEMISH THAT APPEARS AS A GRID OF LINES ALONG FIBER BOUNDARIES IN A MULTIFIBER BUNDLE.

CHIEF RAY

THE CENTRAL RAY OF A BUNDLE OF RAYS OF LIGHT.

CHIP

SEE: FLIP CHIP.

CHROMATIC ABERRATION

IMAGE IMPERFECTION CAUSED BY LIGHT OF DIFFERENT WAVELENGTHS FOLLOWING DIFFERENT PATHS THROUGH AN OPTICAL SYSTEM DUE TO DISPERSION CAUSED BY THE OPTICAL ELEMENTS OF THE SYSTEM.

CHROMATIC DISPERSION

DISPERSION OR DISTORTION OF A PULSE IN AN OPTICAL WAVEGUIDE DUE TO DIFFERENCES IN WAVE VELOCITY CAUSED BY VARIATIONS IN THE INDICES OF REFRACTION FOR DIFFERENT PORTIONS OF THE GUIDE, SINCE THE PROPAGATION VELOCITY VARIES INVERSELY WITH THE INDEX OF REFRACTION, AND THE PROPAGATION TIME FROM THE BEGINNING TO A POINT IN THE GUIDE VARIES DIRECTLY AS THE LENGTH, THE RATE OF CHANGE OF INDEX OF REFRACTION WITH RESPECT TO WAVELENGTH AND THE SPECTRAL WIDTH OF THE SOURCE; THE DIFFERENCES IN DELAY CAUSING THE DISTORTION.

CHROMATIC RESOLVING POWER

THE ABILITY OF AN INSTRUMENT TO SEPARATE TWO ELECTROMAGNETIC-WAVE WAVELENGTHS, EQUAL TO THE RATIO OF THE SHORTER WAVELENGTH DIVIDED BY THE DIFFERENCE BETWEEN THE WAVELENGTHS. NOTE: RESOLVING POWER NORMALY REFERS TO THE ABILITY OF OPTICAL COMPONENTS TO SEPARATE TWO OR MORE OBJECT POINTS CLOSE TOGETHER.

SEE: GRATING CHROMATIC RESOLVING POWER; PRISM CHROMATIC RESOLVING POWER.

CIRCUIT

SEE: DRIVING CIRCUIT.
SEE: INTEGRATED OPTICAL CIRCUIT.

CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR

SEE: INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR.

CLADDED FIBER
SEE: DOPED-SILICA CLADDED FIBER.

CLADDING
AN OPTICAL CONDUCTIVE MATERIAL WITH A LOWER REFRACTIVE INDEX PLACED OVER OR OUTSIDE OF THE CORE MATERIAL OF AN OPTICAL WAVEGUIDE, SUCH AS AN OPTICAL FIBER, OR A THIN FILM ON A SUBSTRATE, THAT SERVES TO REFLECT OR REFRACT LIGHT WAVES SO AS TO CONFINE THEM TO THE CORE, AND SERVES TO PROTECT THE CORE. SYNONYM: COATING. SEE ALSO: BUNDLE JACKET; CORE. SEE: EXTRAMURAL CLADDING; FIBER CLADDING.

CLADDING-GUIDED MODE
IN AN OPTICAL WAVEGUIDE, A TRANSMISSION MODE SUPPORTED BY THE CLADDING, I.E. A MODE IN ADDITION TO THE MODES SUPPORTED BY THE CORE MATERIAL. NOTE: CLADDING-GUIDED MODES ARE USUALLY ATTENUATED BY ABSORPTION BY USING LOSSY CLADDING MEDIA TO PREVENT RECONVERSION OF ENERGY TO CORE-GUIDED MODES AND THUS REDUCE DISPERSION.

CLADDING MODE STRIPPER
A MATERIAL APPLIED TO OPTICAL FIBER CLADDING THAT PROVIDES A MEANS FOR ALLOWING LIGHT ENERGY BEING TRANSMITTED IN THE CLADDING TO LEAVE THE CLADDING OF THE FIBER.
A PIECE OF OPTICAL MATERIAL THAT SUPPORTS ONLY CERTAIN ELECTROMAGNETIC WAVE PROPAGATION MODES, NAMELY NOT THE MODES SUPPORTED BY THE CLADDING ON AN OPTICAL WAVEGUIDE, SUCH AS AN OPTICAL FIBER, SLAB DIELECTRIC WAVEGUIDE OR INTEGRATED OPTICAL CIRCUIT, SO THAT THE STRIPPER EFFECTIVELY REMOVES THE CLADDING MODES WITHOUT DISTURBING THE CORE-SUPPORTED MODES.

CLAD SILICA FIBER
SEE: LOW-LOSS FEP-CLAD SILICA FIBER; PLASTIC-CLAD SILICA FIBER.

CLOSE-CONFINEMENT JUNCTION
SEE: SINGLE HETEROJUNCTION.

CLOSED WAVEGUIDE
A WAVEGUIDE THAT HAS CONDUCTING WALLS, THUS PERMITTING AN INFINITE BUT DISCRETE SET OF PROPAGATION MODES, OF WHICH RELATIVELY FEW ARE PRACTICAL, EACH DISCRETE MODE DEFINING THE PROPAGATION CONSTANT, THE FIELD AT ANY POINT BEING DESCRIBABLE IN TERMS OF THESE MODES, THERE BEING NO RADIATION FIELD, AND DISCONTINUITIES AND BENDS CAUSING MODE CONVERSION BUT NOT RADIATION, FOR EXAMPLE A METALLIC RECTANGULAR-CROSSECTION PIPE. SEE ALSO: OPEN WAVEGUIDE.

COAT
SEE: COHERENT OPTICAL ADAPTIVE TECHNIQUE.

COATED OPTICS
THE USE OF OPTICAL ELEMENTS OR COMPONENTS WHOSE OPTICAL REFRACTING AND

REFLECTING SURFACES HAVE BEEN COATED WITH ONE OR MORE LAYERS OF DIELECTRIC OR METALLIC MATERIAL FOR REDUCING OR INCREASING REFLECTION FROM THE SURFACES. EITHER TOTALLY OR FOR SELECTED WAVELENGTHS AND FOR PROTECTING THE SURFACES FROM ABRASION AND CORROSION.

THE TERM IS USUALLY USED WITH REFERENCE TO ANTIREFLECTION COATINGS OF DIELECTRIC MATERIALS. SUCH AS MAGNESIUM FLUORIDE. SILICON MONOXIDE. SILICON OXIDE. TITANIUM OXIDE. OR ZINC SULFIDE. FOR THE PURPOSES OF REDUCING OR INCREASING REFLECTIONS AND FOR PROTECTING THE SURFACES.

COATING

SEE: ANTIREFLECTION COATING; HIGHLY-REFLECTIVE COATING; OPTICAL PROTECTIVE COATING.

SEE: OPTICAL FIBER COATING.

COEFFICIENT

SEE: ABSORPTION COEFFICIENT; ELECTROOPTIC COEFFICIENT; REFLECTION COEFFICIENT; SCATTERING COEFFICIENT; TRANSMISSION COEFFICIENT.

COHERENT BUNDLE

A BUNDLE OF OPTICAL FIBERS IN WHICH THE SPATIAL COORDINATES OF EACH FIBER ARE THE SAME OR BEAR THE SAME SPATIAL RELATIONSHIP TO EACH OTHER AT THE TWO ENDS OF THE BUNDLE. *SYNONYM: ALIGNED BUNDLE.*

COHERENT LIGHT

LIGHT THAT HAS THE PROPERTY THAT AT ANY POINT IN TIME OR SPACE. PARTICULARLY OVER AN AREA IN A PLANE PERPENDICULAR TO THE DIRECTION OF PROPAGATION OR OVER TIME AT A PARTICULAR POINT IN SPACE. ALL THE PARAMETERS OF THE WAVE ARE PREDICTABLE AND ARE CORRELATED. *SEE: SPACE-COHERENT LIGHT; TIME-COHERENT LIGHT.*

COHERENT OPTICAL ADAPTIVE TECHNIQUE (COAT)

A TECHNIQUE USED TO IMPROVE THE POWER DENSITY OF ELECTROMAGNETIC WAVEFRONTS. SUCH AS THOSE OF A LASER BEAM. PROPAGATING THROUGH TURBULENT ATMOSPHERE. USING APPROACHES LIKE PHASE CONJUGATION. COMPENSATING PHASE SHIFT. APERTURE TAGGING. AND IMAGE SHARPENING.

COLLECTIVE LENS

A LENS OF POSITIVE POWER. SUCH AS A FIELD LENS. USED IN AN OPTICAL SYSTEM TO REFRACT THE CHIEF RAYS OF IMAGE-FORMING BUNDLES OF RAYS. SO THAT THESE RAYS WILL PASS THROUGH SUBSEQUENT OPTICAL ELEMENTS OF THE SYSTEM. NOTE: IF ALL THE RAYS DO NOT PASS THROUGH AN OPTICAL ELEMENT A LOSS OF LIGHT ENSUES. KNOWN AS VIGNETTING. SOMETIMES THE TERM COLLECTIVE LENS IS USED INCORRECTLY TO DENOTE ANY LENS OF POSITIVE POWER. SEE ALSO: CONVERGING LENS.

COLLIMATED LIGHT

A BUNDLE OF LIGHT RAYS IN WHICH THE RAYS EMANATING FROM ANY SINGLE POINT IN THE OBJECT ARE PARALLEL TO ONE ANOTHER SUCH AS THE LIGHT FROM AN INFINITELY DISTANT REAL SOURCE. OR APPARENT SOURCE. SUCH AS A COLLIMATOR RETICLE.

SYNONYM: PARALLEL LIGHT.

COLLIMATED TRANSMITTANCE

TRANSMITTANCE OF AN OPTICAL WAVEGUIDE. SUCH AS AN OPTICAL FIBER OR INTEGRATED OPTICAL CIRCUIT. IN WHICH THE LIGHT WAVE AT THE OUTPUT HAS COHERENCY RELATED TO THE COHERENCY AT THE INPUT.

COLLIMATION

1. THE PROCESS OF ALIGNING THE OPTICAL AXIS OF OPTICAL SYSTEMS TO THE REFERENCE MECHANICAL AXES OR SURFACES OF AN INSTRUMENT; OR THE ADJUSTMENT OF TWO OR MORE OPTICAL AXES WITH RESPECT TO EACH OTHER. 2. THE PROCESS OF MAKING LIGHT RAYS PARALLEL. 3. THE EXTENT TO WHICH AN ELECTROMAGNETIC WAVE IS UNIFORMLY CONSTANT IN PHASE IN A PLANE PERPENDICULAR TO THE DIRECTION OF PROPAGATION. NOTE: A HIGH DEGREE OF COLLIMATION IS OBTAINABLE FROM A LASER THAT OSCILLATES IN A SINGLE LOWEST-ORDER TRANSVERSE MODE. THE OUTPUT HAS ESSENTIALLY A UNIFORM AND CONSTANT PHASE DISTRIBUTION ACROSS THE ENTIRE OUTPUT APERTURE. A DIVERGENCE OF 2 X 10 - 4 RADIANS BEING TYPICAL.

COLLIMATOR

AN OPTICAL DEVICE THAT RENDERS DIVERGING OR CONVERGING LIGHT RAYS PARALLEL. NOTE: IT MAY BE USED TO SIMULATE A DISTANT TARGET. ALIGN THE OPTICAL AXES OF INSTRUMENTS. OR PREPARE RAYS FOR ENTRY INTO THE END OF AN OPTICAL FIBER. FIBER BUNDLE. OR OPTICAL THIN-FILM.

COLOR

THE SENSATION PRODUCED BY LIGHT OF DIFFERENT WAVELENGTHS IN THE VISIBLE SPECTRUM. NOTE: THE COLOR. SHAPE. NUMBER OF NEWTON'S RINGS PRESENT WHEN TWO OPTICAL SURFACES ARE PLACED TOGETHER. AND CHROMATIC ABERRATION. ARE EXAMPLES OF COLOR-RELATED PROPERTIES OF LIGHT.

COLOR-DIVISION MULTIPLEXING (CDM)

IN OPTICAL COMMUNICATION SYSTEMS. THE MULTIPLEXING OF CHANNELS ON A SINGLE TRANSMISSION MEDIUM. SUCH AS USING EACH COLOR AS A CHANNEL IN ONE OPTICAL FIBER OR BUNDLE OF FIBERS. NOTE: CDM IS THE SAME AS FREQUENCY DIVISION MULTIPLEXING IN THE NON-VISIBLE REGION OF THE ELECTROMAGNETIC FREQUENCY SPECTRUM. EACH COLOR CORRESPONDS TO A DIFFERNET FREQUENCY AND A DIFFERENT WAVELENGTH.

COLORIMETER

AN OPTICAL INSTRUMENT USED TO COMPARE THE COLOR OF A SAMPLE WITH A SOURCE REFERENCE OR A SYNTHESIZED STIMULUS. FOR EXAMPLE. IN A THREE-COLOR COLORIMETER. THE SYNTHESIZED STIMULUS IS PRODUCED BY MIXTURES OF THREE COLORS OF FIXED CHROMATICITY. BUT VARIABLE LUMINANCE.

COLOR TEMPERATURE

THE TEMPERATURE OF A BLACKBODY THAT EMITS LIGHT OF THE SAME COLOR AS THE BODY BEING CONSIDERED. NOTE: COLOR TEMPERATURE IS EXPRESSED IN KELVIN.

COMA

AN ABERRATION OF A LENS THAT CAUSES OBLIQUE PENCILS OF LIGHT RAYS FROM AN OBJECT POINT OR SOURCE TO BE IMAGED AS A COMET-SHAPED BLUR.

COMMUNICATIONS
SEE: FIBER-OPTIC COMMUNICATIONS; LIGHTWAVE COMMUNICATIONS.

COMPOUND-GLASS PROCESS
SEE: DOUBLE-CRUCIBLE PROCESS.

COMPOUND LENS
A LENS COMPOSED OF TWO OR MORE SEPARATE PIECES OF GLASS OR OTHER OPTICAL MATERIAL. THESE COMPONENT PIECES OR ELEMENTS MAY OR MAY NOT BE CEMENTED TOGETHER. A COMMON FORM OF COMPOUND LENS IS A TWO ELEMENT OBJECTIVE, ONE ELEMENT BEING A CONVERGING LENS OF CROWN GLASS AND THE OTHER A DIVERGING LENS OF FLINT GLASS. THE COMBINATION OF SUITABLE GLASSES OR OTHER OPTICAL MATERIALS (PLASTICS, MINERALS), PROPERLY GROUND AND POLISHED, REDUCES ABERRATIONS NORMALLY PRESENT IN A SINGLE LENS.

CONCAVE
PERTAINING TO A HOLLOW CURVED SURFACE OF A GIVEN MATERIAL. NOTE: IF A LENS IS IMBEDDED IN A MEDIUM, AND A LENS SURFACE IS CONCAVE, THE CONTIGUOUS SURFACE OF THE MEDIUM IS CONVEX. SEE ALSO: CONVEX.

CONCAVE LENS
SEE: DIVERGING LENS.

CONCAVO-CONVEX LENS
SEE: MENISCUS.

CONCENTRIC LENS
A LENS IN WHICH THE CENTERS OF CURVATURE OF THE SURFACES COINCIDE. NOTE: CONCENTRIC LENSES THUS HAVE A CONSTANT RADIAL THICKNESS IN ALL ZONES.

CONDENSING LENS
A LENS, OR SYSTEM OF LENSES, OF POSITIVE POWER USED FOR CONDENSING, I.E. CONVERGING, RADIANT ENERGY FROM A SOURCE ONTO AN OBJECT.

CONDUCTION BAND
A PARTIALLY FILLED OR EMPTY ENERGY LEVEL, IN THE ATOMIC STRUCTURE OF A MATERIAL, IN WHICH ELECTRONS ARE FREE TO MOVE EASILY, ALLOWING THE MATERIAL TO CONDUCT ELECTRIC CURRENT READILY.

CONDUCTOR
SEE: OPTICAL CONDUCTOR.

CONDUCTOR LOSS
SEE: CONNECTOR INDUCED OPTICAL CONDUCTOR LOSS.

CONDUIT
SEE: NON-COHERENT BUNDLE.

CONE
SEE: ACCEPTANCE CONE.

CONICAL FIBER
SEE: OPTICAL TAPER.

CONNECTION
SEE: LASER SERVICE CONNECTION.

CONNECTOR
SEE: FIXED FIBER-OPTIC CONNECTOR; FREE FIBER-OPTIC CONNECTOR.

CONNECTOR-INDUCED OPTICAL CONDUCTOR LOSS
THAT PART OF CONNECTOR INSERTION LOSS USUALLY EXPRESSED IN DECIBELS (DB) DUE TO IMPURITIES OR STRUCTURAL CHANGES TO THE OPTICAL CONDUCTORS CAUSED BY TERMINATION OR HANDLING WITHIN THE CONNECTOR.

CONNECTOR INSERTION LOSS
THE POWER LOSS SUSTAINED BY A TRANSMISSION MEDIUM, SUCH AS A WIRE, COAXIAL CABLE, OPTICAL FIBER CABLE, OR INTEGRATED OPTICAL CIRCUIT COMPONENT, DUE TO THE INSERTION OF A CONNECTOR BETWEEN TWO ELEMENTS, THAT WOULD NOT OCCUR IF THE MEDIA WERE CONTINUOUS WITHOUT THE CONNECTOR, I.E. THERE WAS NO REFLECTED, ABSORBED, DISPERSED, OR SCATTERED POWER. NOTE: THE POWER LOSS IS EXPRESSED IN DECIBELS (DB) AND IT IS USUALLY DUE TO INSERTION OF A MATED CONNECTOR ONTO A CABLE.

CONSERVATION
SEE: RADIANCE CONSERVATION.

CONSTANT
SEE: BOLTZMANN'S CONSTANT; PROPAGATION CONSTANT.
SEE: ABBE CONSTANT.

CONTACT
SEE: OPTICAL CONTACT.

CONTINUOUS VARIABLE OPTICAL ATTENUATOR
A DEVICE THAT ATTENUATES THE INTENSITY OF LIGHTWAVES, WHEN INSERTED INTO AN OPTICAL WAVEGUIDE LINK, OVER A CONTINUOUS RANGE OF DB, DEPENDING UPON A SETTING OR CONTROL SIGNAL.

CONTRAST TRANSFER FUNCTION
SEE: MODULATION TRANSFER FUNCTION.

CONTROL
SEE: WAVEFRONT CONTROL.

CONVERGENCE

THE BENDING OF LIGHT RAYS TOWARDS EACH OTHER, AS BY A CONVEX OR PLUS LENS.

CONVERGENCE ANGLE

THE ANGLE FORMED BY THE LINES OF SIGHT OF BOTH EYES IN FOCUSSING ON ANY LINE, CORNER, SURFACE, OR PART OF AN OBJECT. SYNONYM: CONVERGENT ANGLE.

CONVERGENT ANGLE

SEE: CONVERGENCE ANGLE.

CONVERGENT LENS

SEE: CONVERGING LENS.

CONVERGING LENS

A LENS THAT ADDS CONVERGENCE TO AN INCIDENT BUNDLE OF LIGHT RAYS. ONE SURFACE OF A CONVERGING LENS MAY BE CONVEXEDLY SPHERICAL AND THE OTHER PLANE (PLANO-CONVEX), BOTH MAY BE CONVEX (DOUBLE-CONVEX, BICONVEX) OR ONE SURFACE MAY BE CONVEX AND THE OTHER CONCAVE (CONVERGING MENISCUS). SYNONYMS: CONVERGENT LENS; CONVEX LENS; COLLECTIVE LENS; CROWN LENS; POSITIVE LENS. SEE ALSO: COLLECTIVE LENS.

CONVEX

PERTAINING TO A *SURFACE OF AN* OBJECT THAT HAS ITS CENTER OF CURVATURE ON THE SAME SIDE OF THE SURFACE AS THE MATERIAL OF WHICH THE OBJECT IS MADE. THUS THE OUTSIDE SURFACE OF A SPHERE OR BALL IS CONVEX. SEE ALSO: CONCAVE.

CONVEX LENS

SEE: CONVERGING LENS.

CORE

THE CENTRAL PRIMARY LIGHT-CONDUCTING REGION OF A MATERIAL MEDIUM, SUCH AS AN OPTICAL FIBER, THE REFRACTIVE INDEX OF WHICH MUST BE HIGHER THAN THAT OF THE CLADDING IN ORDER FOR THE LIGHT WAVES TO BE INTERNALLY REFLECTED OR REFRACTED. MOST OF THE OPTICAL POWER IS IN THE CORE. SEE ALSO: CLADDING. SEE: CABLE CORE, FIBER CORE.

CORE DIAMETER

SEE: FIBER CORE DIAMETER.

CORE FIBER

SEE: LIQUID-CORE FIBER.

CORE-RADII

SEE: MISMATCH-OF-CORE-RADII LOSS.

CORNER-CUBE REFLECTOR
SEE: TRIPLE MIRROR.

CORRECTED LENS
A LENS DESIGNED TO BE RELATIVELY FREE FROM ONE OR MORE ABERRATIONS. FOR EXAMPLE, A SIMPLE LENS WITH AN ASPHERIC SURFACE, OR A COMPOUND LENS CONSISTING OF SEVERAL OPTICAL ELEMENTS AND DIFFERENT GLASSES.

CORNER REFLECTOR
SEE: TRIPLE MIRROR.

COSINE EMISSION LAW
THE ENERGY EMITTED IN ANY DIRECTION BY AN ELECTROMAGNETIC-RADIATOR IS PROPORTIONAL TO THE COSINE OF THE ANGLE THAT THAT DIRECTION MAKES WITH THE NORMAL TO THE EMITTING SURFACE, NAMELY, N = N(O)COS A, WHERE N IS THE RADIANCE, N(O) IS THE RADIANCE NORMAL TO AN EMITTING SURFACE, AND A IS THE ANGLE BETWEEN THE VIEWING DIRECTION AND THE NORMAL TO THE SURFACE. NOTE: EMITTERS THAT RADIATE ACCORDING TO THIS LAW ARE REFERRED TO AS LAMBERTIAN RADIATORS OR SQURCES. SYNONYM: LAMBERT'S EMISSION LAW.

COUPLED MODES
IN A WAVEGUIDE, SUCH AS AN OPTICAL FIBER, COAXIAL CABLE, OR METAL PIPE, PROPAGATION MODES THAT COEXIST, WHOSE FIELDS ARE INTERRELATED, AND WHOSE ENERGIES ARE MUTUALLY INTERCHANGED.

COUPLER
IN OPTICAL TRANSMISSION SYSTEMS, A COMPONENT USED TO INTERCONNECT THREE OR MORE OPTICAL CONDUCTORS. SEE: ACCESS COUPLER; DATA BUS COUPLER; NON-REFLECTIVE STAR-COUPLER; REFLECTIVE STAR-COUPLER; TEE-COUPLER.
SEE: AVALANCHE PHOTODIODE COUPLER; FIBER-OPTIC MULTIPORT COUPLER; FIBER-OPTIC ROD COUPLER; LASER DIODE COUPLER; LIGHT-EMITTING DIODE COUPLER; OPTICAL DIRECTIONAL COUPLER; POSITIVE-INTRINSIC-NEGATIVE PHOTODIODE COUPLER.

COUPLER LOSS
SEE: SOURCE-COUPLER LOSS.

COUPLER-SWITCH-MODULATOR
SEE: INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR.

COUPLING
SEE: FURCATION COUPLING.
SEE: DIRECT COUPLING; END-FIRE COUPLING; EVANESCENT-FIELD COUPLING; FIBER-DETECTOR COUPLING; LENS COUPLING; SOURCE-FIBER COUPLING; TANGENTIAL COUPLING.

COUPLING EFFICIENCY
IN OPTICAL FIBER TRANSMISSION, THE RATIO OF THE OPTICAL POWER ON ONE SIDE OF AN INTERFACE TO THE OPTICAL POWER ON THE OTHER SIDE, SUCH AS THE

RATIO OF THE POWER DEVELOPED BY A LIGHT SOURCE TO THE POWER ACCEPTED BY A BUNDLE OF FIBERS, OR THE POWER RECEIVED AT THE END OF A BUNDLE OF FIBERS TO THE POWER THAT IMPINGES ON A PHOTODETECTOR.

NOTE: FOR LIGHT SOURCES, SUCH AS LEDS, WITH EMITTING AREAS LARGER THAN FIBER CORE DIAMETERS, THE PRODUCT OF FIBER NUMERICAL APERTURE (N.A.) AND CORE DIAMETER IS A GOOD INDICATOR OF MAXIMUM COUPLING EFFICIENCY. FOR OTHER SOURCES, SUCH AS SMALL LASER DIODES WITH EMITTING AREAS SMALLER THAN THE FIBER CORE DIAMETER, THE N.A. ALONE IS A RELEVANT INDICATOR OF COUPLING EFFICIENCY.

COUPLING LOSS

SEE: CONNECTOR INSERTION LOSS.

CRITICAL ANGLE

THE ANGLE, WITH THE NORMAL, AT WHICH AN ELECTROMAGNETIC WAVE INCIDENT UPON AN INTERFACE SURFACE BETWEEN TWO DIELECTRIC MEDIA, AT WHICH TOTAL REFLECTION OF THE INCIDENT WAVE FIRST OCCURS AS THE INCIDENT ANGLE IS INCREASED FROM ZERO, AND BEYOND WHICH TOTAL INTERNAL REFLECTION CONTINUES TO OCCUR THOUGH WITH INCREASED ATTENUATION AT A RATE DETERMINED NOT ONLY BY THE ELECTROMAGNETIC PARAMETERS OF THE MEDIUM, BUT ALSO BY THE FREQUENCY AND THE ANGLE OF INCIDENCE, THUS GUIDING THE WAVE ALONG THE REFLECTING SURFACE WITH NO AVERAGE TRANSPORT OF ENERGY INTO THE SECOND MEDIUM, AND THE INTENSITY OF THE REFLECTED WAVE IS EXACTLY EQUAL TO THE INTENSITY OF THE INCIDENT WAVE.

NOTE: THE WAVE IN AN OPTICAL FIBER WILL BE CONFINED TO THE FIBER FOR ALL ANGLES OF INCIDENCE GREATER THAN THE CRITICAL ANGLE. THE CRITICAL ANGLE IS GIVEN BY: SIN A(C) = SQUARE ROOT E(2)/E(1) WHERE A(C) IS THE CRITICAL ANGLE AND E(2) AND E(1) ARE THE PERMITTIVITIES OF THE TRANSMITTED (OUTSIDE) AND INCIDENT MEDIUM (INSIDE) RESPECTIVELY, AND WHERE E(1) IS ALWAYS GREATER THAN E(2), E.G. THE CASE FOR AN OPTICAL FIBER (CONDUCTING A WAVE), AND AIR. IN TERMS OF INDICES OF REFRACTION, THE CRITICAL ANGLE IS THE ANGLE OF INCIDENCE FROM A DENSER MEDIUM, AT AN INTERFACE BETWEEN THE DENSER AND LESS DENSE MEDIUM, AT WHICH ALL OF THE LIGHT IS REFRACTED ALONG THE INTERFACE, I.E.,THE ANGLE OF REFRACTION IS 90°. WHEN THE CRITICAL ANGLE IS EXCEEDED, THE LIGHT IS TOTALLY REFLECTED BACK INTO THE DENSER MEDIUM. THE CRITICAL ANGLE VARIES WITH THE INDICES OF REFRACTION OF THE TWO MEDIA WITH THE RELATIONSHIP, SIN A(C) = N(2)/N(1), WHERE N(2) IS THE INDEX OF REFRACTION OF THE LESS DENSE MEDIUM AND N(1) IS THE INDEX OF REFRACTION OF THE DENSER MEDIUM, AND A(C) IS THE CRITICAL ANGLE, AS ABOVE. IN TERMS OF TOTAL INTERNAL REFLECTION IN AN OPTICAL FIBER, THE CRITICAL ANGLE IS THE SMALLEST ANGLE MADE BY A MERIDIONAL RAY IN AN OPTICAL FIBER THAT CAN BE TOTALLY REFLECTED FROM THE INNERMOST INTERFACE AND THUS DETERMINES THE MAXIMUM ACCEPTANCE ANGLE AT WHICH A MERIDIONAL RAY CAN BE ACCEPTED FOR TRANSMISSION ALONG A FIBER. SEE ALSO: TOTAL INTERNAL REFLECTION.

CRITICAL RADIUS

1. THE RADIUS OF CURVATURE OF AN OPTICAL FIBER, CONTAINING AN AXIALLY PROPAGATED ELECTROMAGNETIC WAVE, AT WHICH THE FIELD OUTSIDE THE FIBER (THAT DECAYS EXPONENTIALLY IN A DIRECTION TRANSVERSE TO THE DIRECTION OF PROPAGATION) DETACHES ITSELF FROM THE WAVEGUIDE AND RADIATES INTO SPACE BECAUSE THE PHASE FRONT VELOCITY MUST INCREASE TO MAINTAIN PROPER RELATIONSHIP WITH THE GUIDED WAVE, AND THIS VELOCITY CANNOT EXCEED THE VELOCITY OF LIGHT, AS THE WAVE FRONT SWEEPS AROUND THE CURVED FIBER. NOTE: THIS CAUSES ATTENUATION DUE TO A RADIATION LOSS. 2. THE RADIUS OF CURVATURE OF AN OPTICAL FIBER AT WHICH THERE IS AN APPRECIABLE PROPAGATION MODE CONVERSION LOSS DUE TO THE ABRUPTNESS OF THE TRANSITION FROM STRAIGHT TO

CURVED. NOTE: FOR A RADIUS OF CURVATURE GREATER THAN THE CRITICAL VALUE, THE FIELDS BEHAVE ESSENTIALLY AS IN A STRAIGHT GUIDE. FOR RADII SMALLER THAN THE CRITICAL VALUE, CONSIDERABLE MODE CONVERSION TAKES PLACE.

CROSS TALK

IN AN OPTICAL TRANSMISSION SYSTEM, LEAKAGE OF OPTICAL POWER FROM ONE OPTICAL CONDUCTOR TO ANOTHER.

NOTE: THE LEAKAGE MAY OCCUR BY FRUSTRATED TOTAL REFLECTION FROM INADEQUATE CLADDING THICKNESS OR LOW ABSORPTIVE QUALITY. SEE: FIBER CROSSTALK.

CROWN LENS

SEE: CONVERGING LENS.

CRUCIBLE PROCESS

SEE: DOUBLE-CRUCIBLE PROCESS (DC).

CRYSTAL

SEE: DOUBLY-REFRACTING CRYSTAL; MULTI-REFRACTING CRYSTAL.

CRYSTAL OPTICS

THE STUDY OF THE PROPAGATION OF RADIANT ENERGY THROUGH CRYSTALS, ESPECIALLY ANISOTROPIC CRYSTALS, AND THEIR EFFECTS ON POLARIZATION OF ELECTROMAGNETIC WAVES, PARTICULARLY LIGHT WAVES.

CURRENT

SEE: DARK CURRENT.

CURVATURE

IN THE MEASUREMENT OR SPECIFICATION OF LENSES, THE AMOUNT OF DEPARTURE FROM A FLAT SURFACE. NOTE: IT IS SPECIFIED AS THE RECIPROCAL OF THE RADIUS OF CURVATURE. SEE: FIELD CURVATURE.

CURVE

SEE: ABSOLUTE LUMINOSITY CURVE; LUMINOSITY CURVE.

CUT-OFF FREQUENCY

IN A WAVE GUIDE, SUCH AS A HOLLOW RECTANGULAR-CROSS-SECTION PIPE OR AN OPTICAL FIBER, THE FREQUENCY BELOW WHICH A SPECIFIED MODE OF PROPAGATION FAILS TO EXIST. NOTE: IN A CLADDED OPTICAL FIBER, A MODE IS CUT-OFF WHEN THE FIELD NO LONGER DECAYS IN THE CLADDING.

CVPO

SEE: CHEMICAL VAPOR-PHASE OXIDATION PROCESS.

CYLINDRICAL LENS

A LENS WITH A CYLINDRICAL SURFACE. NOTE: CYLINDRICAL LENSES ARE USED IN RANGEFINDERS TO INTRODUCE ASTIGMATISM IN ORDER THAT A POINT-LIKE SOURCE

MAY BE IMAGED AS A LINE OF LIGHT. BY COMBINING CYLINDRICAL AND SPHERICAL SURFACES, AN OPTICAL SYSTEM CAN BE DESIGNED THAT GIVES A CERTAIN MAGNIFICATION IN A GIVEN ASIMUTH OF THE IMAGE AND A DIFFERENT MAGNIFICATION AT RIGHT ANGLES IN THE SAME IMAGE PLANE. SUCH A SYSTEM IS DESIGNATED AS BEING ANAMORPHIC.

D

DARK ADAPTATION

THE ABILITY OF THE HUMAN EYE TO ADJUST ITSELF TO LOW LEVELS OF ILLUMINATION.

D

SEE: D-STAR

DARK CURRENT

THE CURRENT THAT FLOWS IN A PHOTODETECTOR WHEN THERE IS NO RADIANT ENERGY OR LIGHT FLUX INCIDENT UPON ITS SENSITIVE SURFACE, I.E., TOTAL DARKNESS. NOTE: DARK CURRENT GENERALLY INCREASES WITH INCREASED TEMPERATURE FOR MOST PHOTODETECTORS.

DATA BUS

IN AN OPTICAL COMMUNICATION SYSTEM, AN OPTICAL WAVEGUIDE USED AS A COMMON TRUNK LINE TO WHICH A NUMBER OF TERMINALS CAN BE INTERCONNECTED USING OPTICAL COUPLERS.

DATA BUS COUPLER

IN AN OPTICAL COMMUNICATION SYSTEM, A COMPONENT THAT INTERCONNECTS A NUMBER OF OPTICAL WAVEGUIDES AND PROVIDES AN INHERENTLY BIDIRECTIONAL SYSTEM BY MIXING AND SPLITTING ALL SIGNALS WITHIN THE COMPONENT.

DATA LINK

SEE: OPTICAL DATA LINK.

DECOLLIMATION

IN A LIGHT-WAVE GUIDE, SUCH AS AN OPTICAL FIBER OR INTEGRATED OPTICAL CIRCUIT, THE SPREADING OR DIVERGENCE OF LIGHT DUE TO INTERNAL AND END EFFECTS, SUCH AS CURVATURE, IRREGULARITIES OF SURFACES, ERRATIC VARIATIONS IN REFRACTIVE INDICES, OCCLUSIONS, AND OTHER BLEMISHES THAT MAY CAUSE DISPERSION, ABSORPTION, SCATTERING, DEFLECTION, DIFFRACTION, REFLECTION, REFRACTION, OR OTHER EFFECTS.

DEFECT ABSORPTION

SEE: ATOMIC DEFECT ABSORPTION.

DEGRADATION
SEE: CATASTROPHIC DEGRADATION; GRADUAL DEGRADATION.

DELAY DISTORTION
SEE: WAVEGUIDE DELAY DISTORTION.

DELAY SPREAD
SEE: MULTIMODE GROUP-DELAY SPREAD.

DENSITY
SEE: OPTICAL ENERGY DENSITY; OPTICAL POWER DENSITY; PACKING DENSITY; SPECTRAL DENSITY.
SEE: DIFFUSE DENSITY; INTERNAL OPTICAL DENSITY; LUMINOUS DENSITY; OPTICAL DENSITY; UNIFORM DENSITY.

DEPOSITION PROCESS
SEE: MODIFIED CHEMICAL VAPOR DEPOSITION PROCESS.
SEE: PLASMA-ACTIVATED CHEMICAL VAPOR DEPOSITION PROCESS (PACVD).

DETECTIVITY
THE RECIPROCAL OF NOISE EQUIVALENT POWER (NEP), I.E., D = 1/NEP, WHERE NEP IS USUALLY MEASURED IN WATTS.

DETECTOR
A DEVICE RESPONSIVE TO THE PRESENCE OF A STIMULUS. SEE: EXTERNAL PHOTOEFFECT DETECTOR; INTERNAL PHOTOEFFECT DETECTOR; OPTICAL DETECTOR; PHOTODETECTOR; PHOTON DETECTOR.

DETECTOR COUPLING
SEE: FIBER-DETECTOR COUPLING.

DETECTOR NOISE-LIMITED OPERATION
IN OPTICAL COMMUNICATION SYSTEM OPERATIONS, THE SITUATION THAT OCCURS WHEN THE AMPLITUDE OF PULSES, RATHER THAN THEIR WIDTH, LIMIT THE DISTANCE BETWEEN REPEATERS. NOTE: IN THIS REGIME OF OPERATION, THE LOSSES ARE SUFFICIENT TO ATTENUATE THE AMPLITUDE OF THE PULSE SO MUCH, IN RELATION TO THE DETECTOR NOISE LEVEL, TO PREVENT AN INTELLIGENT DECISION BASED ON THE PRESENCE OR ABSENCE OF A PULSE IN THE INTELLIGENT SIGNAL. SEE ALSO: DISPERSION-LIMITED OPERATION.

DEVIATION ANGLE
THE ANGULAR CHANGE IN DIRECTION OF A LIGHT RAY AFTER CROSSING THE INTERFACE BETWEEN TWO DIFFERENT MEDIA.
THE ANGLE THROUGH WHICH A RAY OF LIGHT IS BENT BY REFLECTION OR REFRACTION.

DEVICE

SEE: OPTOELECTRONIC DEVICE; PHOTOCONDUCTIVE DEVICE.

DEVITRIFICATION

THE CHANGING OF GLASS FROM THE VITREOUS (GLASSY) STATE TO A CRYSTALLINE STATE, THUS GREATLY CHANGING MOST OF ITS OPTICAL PROPERTIES, USUALLY FOR THE WORSE FOR OPTICAL PURPOSES, SUCH AS REDUCED LIGHT TRANSMISSION IN OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS.

DIAMETER

SEE: BEAM DIAMETER.
SEE: FIBER CORE DIAMETER; FIBER DIAMETER.

DICHROIC

PERTAINING TO THE QUALITY OF DICHROISM.

DICHROIC FILTER

AN OPTICAL FILTER CAPABLE OF TRANSMITTING ALL FREQUENCIES ABOVE A CERTAIN CUT-OFF FREQUENCY AND REFLECTING ALL LOWER FREQUENCIES, THUS BEING EITHER A HIGH-PASS OR A LOW-PASS FILTER.

DICHROISM

IN ANISTROPIC MATERIALS, SUCH AS SOME CRYSTALS, THE SELECTIVE ABSORPTION OF LIGHT RAYS VIBRATING IN ONE PARTICULAR PLANE RELATIVE TO THE CRYSTALLINE AXES, BUT NOT THOSE VIBRATING IN A PLANE AT RIGHT ANGLES THERETO. NOTE: AS APPLIED TO ISOTROPIC MATERIALS, THIS TERM REFERS TO THE SELECTIVE REFLECTION AND TRANSMISSION OF LIGHT AS A FUNCTION OF WAVELENGTH REGARDLESS OF ITS PLANE OF VIBRATION. THE COLOR OF SUCH MATERIALS, AS SEEN BY TRANSMITTED LIGHT, VARIES WITH THE THICKNESS OF MATERIAL EXAMINED. SYNONYMS: LIGHT, VARIES WITH THE THICKNESS OF MATERIAL EXAMINED. SYNONYMS: DICHROMATISM; POLYCHROMATISM.

DICHROMATISM

SEE: DICHROISM.

DIELECTRIC FILM

SEE: MULTILAYER DIELECTRIC FILM.

DIELECTRIC OPTICAL WAVEGUIDE

SEE: SLAB-DIELECTRIC OPTICAL WAVEGUIDE.

DIFFERENTIAL QUANTUM EFFICIENCY

THE SLOPE OF AN OUTPUT VERSUS INPUT CURVE OF A DEVICE, SUCH AS A PHOTON DETECTOR IN WHICH CHANGES IN INPUT ENERGY OR POWER CAUSES CHANGES IN OUTPUT ENERGY OR POWER, PLOTTED WITH INPUT AS THE ABSCISSA AND OUTPUT AS THE ORDINATE, THE DIFFERENTIAL QUANTUM EFFICIENCY AT ANY OPERATING POINT BEING A SMALL CHANGE IN OUTPUT DIVIDED BY THE CORRESPONDING SMALL CHANGE IN INPUT THAT CAUSED THE OUTPUT CHANGE.

DIFFRACTION

THE PROCESS BY MEANS OF WHICH THE PROPAGATION OF RADIANT WAVES OR LIGHT WAVES ARE MODIFIED AS THE WAVE INTERACTS WITH AN OBJECT OR OBSTACLES. NOTE: SOME OF THE RAYS ARE DEVIATED FROM THEIR PATH BY DIFFRACTION AT THE OBJECTS WHEREAS OTHER RAYS REMAIN UNDEVIATED BY DIFFRACTION AT THE OBJECTS. AS THE OBJECTS BECOME SMALL IN COMPARISON WITH THE WAVELENGTH, THE CONCEPTS OF REFLECTION AND REFRACTION BECOME USELESS AND DIFFRACTION PLAYS THE DOMINANT ROLE IN DETERMINING THE REDISTRIBUTION OF THE RAYS FOLLOWING INCIDENCE UPON THE OBJECTS. DIFFRACTION RESULTS IN A DEVIATION OF LIGHT FROM THE PATHS AND FOCI PRESCRIBED BY THE RECTILINEAR PROPAGATION PRE-SCRIBED BY GEOMETRICAL OPTICS. THUS, EVEN WITH A VERY SMALL, DISTANT SOURCE, SOME LIGHT, IN THE FORM OF BRIGHT AND DARK BANDS, IS FOUND WITHIN A GEOMETRICAL SHADOW BECAUSE OF THE DIFFRACTION OF THE LIGHT AT THE EDGE OF THE OBJECT FORMING THE SHADOW. GRATINGS WITH SPACINGS OF THE ORDER OF THE WAVELENGTH OF THE INCIDENT LIGHT, CAUSE DIFFRACTION. SUCH GRATINGS CAN BE RULED GRIDS, SPACED SPOTS, OR CRYSTAL LATTICE STRUCTURES.

DIFFRACTION GRATING

AN ARRAY OF FINE, PARALLEL, EQUALLY SPACED REFLECTING OR TRANSMITTING LINES THAT MUTUALLY ENHANCE THE EFFECTS OF DIFFRACTION AT THE EDGES OF EACH SO AS TO CONCENTRATE THE DIFFRACTED LIGHT VERY CLOSE TO A FEW DIRECTIONS CHARACTERISTIC OF THE SPACING OF THE LINES AND THE WAVELENGTH OF THE DIFFRACTED LIGHT. NOTE: IF I IS THE ANGLE OF INCIDENCE, D THE ANGLE OF DIFFRACTION, S THE CENTER-TO-CENTER DISTANCE BETWEEN SUCCESSIVE RULINGS, N THE ORDER OF THE SPECTRUM, THE WAVELENGTH IS L = (S/N) (SIN I + SIN D). IF THERE IS A LARGE NUMBER OF NARROW, CLOSE, EQUALLY SPACED RULINGS UPON A TRANSPARENT OR REFLECTING SUBSTRATE, THE GRATING WILL BE CAPABLE OF DIS-PERSING INCIDENT LIGHT INTO ITS FREQUENCY COMPONENT SPECTRUM.

DIFFRACTION GRATING SPECTRAL ORDER

THE INTEGERS THAT DISTINGUISH THE DIFFERENT DIRECTIONS OF EACH MEMBER OF A FAMILY OF LIGHT RAYS EMERGING FROM A DIFFRACTION GRATING, FOR EXAMPLE WHEN A BEAM OF PARALLEL RAYS OF MONOCHROMATIC LIGHT PASS THROUGH A DIFFRACTION GRATING, THE EMERGENT RAYS THAT HAVE REMAINED UNDEVIATED BELONG TO THE ZERO SPECTRAL ORDER, BUT THE LIGHT FLUX IN THE FAMILY OF DEVIATED RAYS THAT EMERGE AFTER DIFFRACTION AT THE GRATING EXHIBIT PRONOUNCED MAXIMA ALONG WELL DEFINED AND ENUMERABLE DIRECTIONS, ON EACH SIDE OF THE UNDEVIATED BEAMS. NOTE: THE INTEGERS THAT ARE ASSIGNED TO DISTINGUISH THESE DIRECTIONS MARK THE SPECTRAL ORDERS. SEE ALSO: GRATING CHROMATIC RESOLVING POWER.

DIFFUSE DENSITY

THE LOGARITHM TO THE BASE 10 OF THE RECIPROCAL OF DIFFUSE TRANSMITTANCE.

DIFFUSE REFLECTANCE

1. THE RATIO OF LIGHT FLUX REFLECTED DIFFUSELY IN ALL DIRECTIONS TO THE TOTAL FLUX AT INCIDENCE, SPECULAR REFLECTION EXCLUDED. 2. THE REFLECTANCE OF A SAMPLE RELATIVE TO A PERFECTLY DIFFUSING, AND PERFECTLY REFLECTING STANDARD WITH 45-DEGREE INCIDENCE ANGLE AND OBSERVATION ALONG THE PERPENDICULAR TO THE SURFACE. SYNONYM: TOTAL DIFFUSE REFLECTANCE.

DIFFUSE TRANSMITTANCE

1. THE TRANSMITTANCE MEASURED WITH DIFFUSELY INCIDENT FLUX. 2. THE

RATIO OF THE FLUX DIFFUSELY TRANSMITTED IN ALL DIRECTIONS TO THE TOTAL INCIDENT FLUX.

DIFFUSED OPTICAL WAVEGUIDE

AN OPTICAL-WAVELENGTH ELECTROMAGNETIC WAVEGUIDE CONSISTING OF A SUBTRATE, SUCH AS AN OPTICAL-QUALITY SINGLE CRYSTAL OF ZINC SELENIDE (ZNSE) OR CADMIUM SULPHIDE (CDS), INTO THE OUTER LAYERS OF WHICH A DIFFUSANT, SUCH AS CADMIUM TO REPLACE THE SELENIUM IN ZNSE, OR SELENIUM TO REPLACE THE SULPHUR, HAS BEEN DIFFUSED TO A DEPTH OF A FEW MICRONS, THUS PRODUCING A LOWER INDEX OF REFRACTION ON THE OUTSIDE, THUS PRODUCING A WAVEGUIDE WITH A GRADED INDEX OF REFRACTION.

SEE: STRIP-LOADED DIFFUSED OPTICAL WAVEGUIDE.

DIFFUSION

THE SCATTERING OF LIGHT BY REFLECTION OR TRANSMISSION. NOTE: DIFFUSE REFLECTION RESULTS WHEN LIGHT STRIKES AN IRREGULAR SURFACE SUCH AS A FROSTED WINDOW OR THE SURFACE OF A FROSTED OR COATED LIGHT BULB. WHEN LIGHT IS DIFFUSED, NO DEFINITE IMAGE IS FORMED.

DIODE

SEE: INJECTION LASER DIODE; LASER DIODE; SUPERLUMINESCENT DIODE (SLD); LIGHT EMITTING DIODE; PIN DIODE.

SEE: DOUBLE HETEROJUNCTION DIODE; FIVE-LAYER FOUR-HETEROJUNCTION DIODE; FOUR-HETEROJUNCTION DIODE; LARGE OPTICAL-CAVITY DIODE; MONORAIL DOUBLE-HETEROJUNCTION DIODE; RESTRICTED EDGE-EMITTING DIODE.

DIODE COUPLER

SEE: AVALANCHE PHOTODIODE COUPLER; LASER DIODE COUPLER; LIGHT-EMITTING DIODE COUPLER; POSITIVE-INTRINSIC-NEGATIVE PHOTODIODE COUPLER.

DIODE LASER

SEE SEMICONDUCTOR LASER.

DIOPT

SEE: DIOPTER.

DIOPTER

A UNIT OF REFRACTIVE POWER OF A LENS OR PRISM, EQUAL TO THE RECIPROCAL OF THE FOCAL LENGTH IN METERS. ABBREVIATED AS DIOPH.

DIRECT COUPLING

IN OPTICAL WAVEGUIDES, SUCH AS OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS, THE TRANSFER OF ELECTROMAGNETIC ENERGY FROM SOURCE TO GUIDE, OR FROM GUIDE TO GUIDE, BY BUTTING THE SOURCE DIRECTLY UP AGAINST THE SINK, FOR EXAMPLE BUTTING A LED UP AGAINST A FIBER OR FIBER BUNDLE. NOTE: THE INPUT COUPLING COEFFICIENT BY DIRECT COUPLING IS PROPORTIONAL TO THE SQUARE OF THE NUMERICAL APERTURE, VALUES RANGING FROM 0.14 TO 0.50. SEE ALSO: LENS COUPLING.

DIRECTIONAL COUPLER

SEE: OPTICAL DIRECTIONAL COUPLER.

DISC

SEE: OPTICAL VIDEO DISC.

DISPERSION

1. THE PROCESS BY WHICH RAYS OF LIGHT OF DIFFERENT WAVELENGTH ARE DEVIATED ANGULARLY BY DIFFERENT AMOUNTS AS, FOR EXAMPLE, WITH PRISMS AND DIFFRACTION GRATINGS.

2. PHENOMENA THAT CAUSE THE INDEX OF REFRACTION AND OTHER OPTICAL PROPERTIES OF A MEDIUM TO VARY WITH WAVELENGTH. NOTE: DISPERSION ALSO REFERS TO THE FREQUENCY DEPENDENCE OF ANY OF SEVERAL PARAMETERS, FOR EXAMPLE, IN THE PROCESS BY WHICH AN ELECTROMAGNETIC SIGNAL IS DISTORTED BECAUSE THE VARIOUS FREQUENCY COMPONENTS OF THAT SIGNAL HAVE DIFFERENT PROPAGATION CHARACTERISTICS AND PATHS. THUS, THE COMPONENTS OF A COMPLEX RADIATION ARE DISPERSED OR SEPARATED ON THE BASIS OF SOME CHARACTERISTIC. A PRISM DISPERSES THE COMPONENTS OF WHITE LIGHT BY DEVIATING EACH WAVELENGTH A DIFFERENT AMOUNT. SEE: CHROMATIC DISPERSION; MATERIAL DISPERSION; OPTICAL MULTIMODE DISPERSION; PULSE DISPERSION; WAVEGUIDE DISPERSION.

SEE: FIBER DISPERSION; MATERIAL DISPERSION.

DISPERSION ATTENUATION

SEE: OPTICAL DISPERSION ATTENUATION.

DISPERSION EQUATION

AN EQUATION THAT INDICATES THE DEPENDENCE OF THE REFRACTIVE INDEX OF A MEDIUM ON THE WAVELENGTH OF THE LIGHT CONDUCTED OR TRANSMITTED BY THE MEDIUM. NOTE: THE ADJUSTMENT OF THE INDEX FOR WAVELENGTH PERMITS MORE ACCURATE CALCULATION OF ANGLES OR PATHS THAT ARE DEPENDENT UPON THE INDEX. OFTEN IT IS NECESSARY TO OBTAIN A VALUE OF THE RATE OF CHANGE OF THE REFRACTIVE INDEX WITH RESPECT TO THE WAVELENGTH. THE DISPERSION EQUATION ATTRIBUTED TO HARTMANN IS N = N(O) + C/(L-L(O)).
THAT ATTRIBUTED TO CAUCHY IS N = A + B/(L SQUARE) + C/L (FOURTH) A MORE COMPLICATED ONE DERIVED BY SELLMEIER IS N SQUARE = 1 + SUM (I=O TO M) OF (A(I)L SQUARE) / ((L SQUARE) - (L (I) SQUARE)) AN EXTENSION OF THE SELLMEIER EQUATION THAT IS USEFUL FOR COVERING MORE THAN ONE ABSORPTION REGION IS
SUM (I=O TO M) OF A (I) L SQU/(L SQU - L (I) SQU)
FINALLY, THE HELMHOLTZ EXPRESSION, WHICH INCLUDES AN ADDITIONAL TERM B(I)/(L SQU-L(I) SQU) IS USEFUL WITHIN ABSORPTION REGIONS AS WELL. USUALLY, SOME OF THE TERMS OF THE SUMMATION ARE REPLACED BY A CONSTANT. IN PRACTICE, ONE OF THE ABOVE EXPRESSIONS IS OFTEN USED, AND THEN A MORE ACCURATE FIT IS FOUND BY AN APPROPRIATE CURVE-FITTING TECHNIQUE SUCH AS THE METHOD OF LEAST SQUARES.

DISPERSION-LIMITED OPERATION

IN OPTICAL COMMUNICATION SYSTEM OPERATIONS, THE SITUATION THAT OCCURS WHEN THE DISPERSION OF THE PULSE, RATHER THAN ITS AMPLITUDE, LIMITS THE DISTANCE BETWEEN REPEATERS. NOTE: IN THIS REGIME OF OPERATION, WAVEGUIDE AND MATERIAL DISPERSION ARE SUFFICIENT TO PRECLUDE AN INTELLIGENT DECISION BASED ON THE PRESENCE OR ABSENCE OF A PULSE IN THE INTELLIGENCE SIGNAL. SEE ALSO: DETECTOR NOISE-LIMITED OPERATION.

DISPERSIVE LENS
SEE: DIVERGING LENS.

DISPLACEMENT LOSS
SEE: LATERAL DISPLACEMENT LOSS.

DISSECTOR
SEE: IMAGE DISSECTOR.

DISTORTION
SEE: OPTICAL DISTORTION.
SEE: RADIAL DISTORTION; WAVEGUIDE DELAY DISTORTION.

DISTRIBUTION
SEE: POISSON DISTRIBUTION.

DIVERGENCE
THE BENDING OF ELECTROMAGNETIC WAVES, SUCH AS LIGHT RAYS, AWAY FROM EACH OTHER, AS BY A CONCAVE OR MINUS LENS, A CONVEX MIRROR, OR A PARABOLIC DISH-LIKE ANTENNA. NOTE: IN A BINOCULAR INSTRUMENT, DIVERGENCE IS THE HORIZONTAL ANGULAR DISPARITY BETWEEN THE IMAGES OF A COMMON OBJECT, AS SEEN THROUGH THE LEFT AND RIGHT SYSTEMS. DIVERGENCE IS POSITIVE WHEN THE RIGHT IMAGE IS TO THE RIGHT OF THE LEFT IMAGE. SEE: BEAM DIVERGENCE.

DIVERGENT LENS
SEE: DIVERGING LENS.

DIVERGENT MENISCUS LENS
A LENS WITH ONE CONVEX SURFACE AND ONE CONCAVE SURFACE, THE LATTER HAVING THE GREATER CURVATURE OR POWER, THE LENS THUS BEHAVING GENERALLY LIKE A CONCAVO-CONCAVE LENS, I.E. BEING A NEGATIVE MENISCUS. SYNONYM: DIVERGING MENISCUS LENS; NEGATIVE MENISCUS.

DIVERGING BEAM
A BEAM OF LIGHT THAT IS NOT COLLIMATED, FOR EXAMPLE, ONE WHOSE WAVEFRONT IS SPHERICAL. NOTE: A HIGH DEGREE OF COLLIMATION, I.E., MINIMAL DIVERGENCE IS REQUIRED TO COUPLE ENERGY INTO AN OPTICAL FIBER WAVEGUIDE. LASERS PRODUCE BEAMS WITH A HIGH DEGREE OF COLLIMATION AND UNIFORM PHASE, AS THOUGH THE MONOCHROMATIC LIGHT WAS EMANATING FROM A DISTANT SOURCE.

DIVERGING LENS
A LENS THAT CAUSES PARALLEL LIGHT RAYS TO SPREAD OUT. NOTE: ONE SURFACE OF A DIVERGING LENS MAY BE CONCAVELY SPHERICAL AND THE OTHER PLANE (PLANO-CONCAVE), BOTH MAY BE CONCAVE (DOUBLE CONCAVE) OR ONE SURFACE MAY BE CONCAVE AND THE OTHER CONVEX (CONCAVE-CONVEX, DIVERGENT-MENISCUS). THE DIVERGING LENS IS ALWAYS THICKER AT THE EDGE THAN AT THE CENTER. SYNONYM: CONCAVE LENS; DISPERSIVE LENS; DIVERGENT LENS; NEGATIVE LENS.
THE DIVERGING LENS IS CONSIDERED TO HAVE A NEGATIVE FOCAL LENGTH.

MEASURED FROM THE FOCAL POINT TOWARD THE OBJECT. SYNONYM: MINUS LENS.

DIVERGING MENISCUS LENS
SEE: DIVERGENT MENISCUS LENS.

DIVISION MULTIPLEX
SEE: WAVELENGTH DIVISION MULTIPLEX.

DIVISION MULTIPLEXING
SEE: COLOR-DIVISION MULTIPLEXING.
SEE: OPTICAL SPACE-DIVISION MULTIPLEXING.

DOPANT
A MATERIAL MIXED, FUSED, AMALGAMATED, CRYSTALLIZED OR OTHERWISE ADDED TO ANOTHER (INTRINSIC) MATERIAL IN ORDER TO ACHIEVE DESIRED CHARACTERISTICS OF THE RESULTING MATERIAL, FOR EXAMPLE, THE GERMANIUM TETRACHLORIDE OR TITANIUM TETRACHLORIDE USED TO INCREASE THE REFRACTIVE INDEX OF GLASS FOR USE AS AN OPTICAL FIBER CORE MATERIAL, OR THE GALLIUM OR ARSENIC ADDED TO SILICON OR GERMANIUM TO PRODUCE A DOPED SEMICONDUCTOR FOR ACHIEVING DONOR OR ACCEPTOR, POSITIVE OR NEGATIVE MATERIAL FOR DIODE AND TRANSISTOR ACTION.

DOPED-SILICA CLADDED FIBER
AN OPTICAL FIBER CONSISTING OF A DOPED SILICA CORE WITH DOPED SILICA CLADDING, USUALLY PRODUCED BY THE CHEMICAL VAPOR DEPOSITION (CVD) PROCESS. NOTE: THIS FIBER HAS A VERY LOW LOSS AND MODERATE DISPERSION. IT IS A STEP-INDEXED FIBER.

DOPED-SILICA GRADED FIBER
AN OPTICAL FIBER CONSISTING OF A SILICA FIBER IN WHICH THE DOPING VARIES SO AS TO PRODUCE A DECREASING REFRACTIVE INDEX FROM THE CENTER TOWARD THE OUTSIDE, THUS ELIMINATING THE NECESSITY OF CLADDING. NOTE: THE REFRACTIVE INDEX PROFILE IS GRADED AND TAILORED TO REDUCE MULTIMODE DISPERSION, SINCE THE NON-AXIAL RAYS OF LIGHT, THOUGH TRAVELING FURTHER, TRAVEL FASTER IN THE OUTER MEDIUM WHERE THE REFRACTIVE INDEX IS LOWER, THUS THE AXIAL RAYS ARRIVE AT THE END OF THE FIBER THE SAME TIME AS THE NON-AXIAL OR PARAXIAL RAYS.

DOUBLE-CRUCIBLE PROCESS (DC)
A PROCESS OF PRODUCING OPTICAL FIBERS IN WHICH TWO CONCENTRIC CRUCIBLES ARE USED, ONE FOR THE CORE GLASS AND ONE FOR THE CLADDING GLASS, THE CLADDED FIBER BEING DRAWN OUT THE BOTTOM, AND DIFFUSION OF THE MATERIALS IN THE GLASSES TO EACH OF THE GLASSES PRODUCES A GRADED INDEX (GI) FIBER. SYNONYM: COMPOUND-GLASS PROCESS; ION-EXCHANGE PROCESS.

DOUBLE HETEROJUNCTION
IN A LASER DIODE, TWO HETEROJUNCTIONS IN CLOSE PROXIMITY, RESULTING IN FULL CARRIER AND RADIATION CONFINEMENT AND IMPROVED CONTROL OF RECOMBINATIONS.

DOUBLE HETEROJUNCTION DIODE
A LASER DIODE THAT HAS TWO DIFFERENT HETEROJUNCTIONS, THE DIFFERENCE

BEING PRIMARILY IN THE STEPPED CHANGES IN REFRACTIVE INDICES OF THE MATERIAL IN THE VICINITY OF THE P-N JUNCTION. NOTE: THE DOUBLE HETEROJUNCTION LASER DIODE IS WIDELY USED FOR PULSE-CODE (CW) OPERATION. SEE: MONORAIL DOUBLE-HETEROJUNCTION DIODE.

DOUBLE-IMAGE

PERTAINING TO THE DOUBLING OF AN IMAGE CAUSED BY OPTICAL IMPERFECTIONS IN THE OPTICAL SYSTEM.

DOUBLET

IN OPTICS, A COMPOUND LENS CONSISTING OF TWO ELEMENTS. NOTE: IF THERE IS AN AIR SPACE BETWEEN THE ELEMENTS IT IS CALLED AN AIR-SPACED DOUBLET. IF THE INNER SURFACES ARE CEMENTED TOGETHER, IT IS CALLED A CEMENTED DOUBLET.

DOUBLY-REFRACTING CRYSTAL

A TRANSPARENT CRYSTALLINE SUBSTANCE THAT IS ANISOTROPIC WITH RESPECT TO THE VELOCITY OF LIGHT TRAVELLING WITHIN IT IN TWO DIFFERENT DIRECTIONS, I.E. WITH RESPECT TO ITS REFRACTIVE INDEX IN TWO DIFFERENT DIRECTIONS.

DRIVE CIRCUIT

IN OPTICAL FIBER TRANSMISSION SYSTEMS, THE ELECTRICAL CIRCUIT THAT DRIVES THE LIGHT-EMITTING SOURCE, MODULATING IT IN ACCORDANCE WITH AN INTELLIGENCE-BEARING SIGNAL.

D-STAR

DETECTIVITY OF A PHOTODETECTOR MULTIPLIED BY THE SQUARE ROOT OF THE DETECTOR AREA AND THE SQUARE ROOT OF THE DETECTOR BANDWIDTH. NOTE: THE CONCEPT OF D-STAR IS USEFUL BECAUSE THE NOISE EQUIVALENT POWER (NEP) OF MANY DETECTORS IS PROPORTIONAL TO THE SQUARE ROOT OF THE PRODUCT OF DETECTOR AREA AND BANDWIDTH, THUS, D-STAR NORMALIZES THE DETECTIVITY TO THESE PARAMETERS. THE UNIT OF D-STAR IS (METERS) (SQ. ROOT HZ)/WATT.

DYNAMIC SCANNING

IN OPTICAL FIBER TRANSMISSION SYSTEMS, A TECHNIQUE IN WHICH A FIBER BUNDLE IS VIBRATED ABOUT A FIXED POINT WITH REFERENCE TO THE IMPRESSED IMAGE IN ORDER TO SUPPRESS THE FIBER PATTERN, I.E. RENDER THE FIBER PATTERN LESS VISIBLE AT THE OUTPUT END.

E

EDGE-EMITTING DIODE

SEE: RESTRICTED EDGE-EMITTING DIODE.

EDGE-EMITTING LED

A LIGHT EMITTING DIODE WITH A SPECTRAL OUTPUT THAT EMANATES FROM BETWEEN THE HETEROGENEOUS LAYERS, I.E. FROM AN EDGE, HAVING A HIGHER OUTPUT INTENSITY AND GREATER COUPLING EFFICIENCY TO AN OPTICAL FIBER OR INTEGRATED OPTICAL CIRCUIT THAN THE SURFACE-EMITTING LED, BUT NOT AS GREAT AS THE INJECTION LASER. NOTE: SURFACE-EMITTING AND EDGE-EMITTING LEDS PROVIDE SEVERAL MILLIWATTS OF POWER IN THE 0.8 - 1.2 MICRON SPECTRAL RANGE AT DRIVE CURRENTS OF 100-200 MILLIAMPERES; DIODE LASERS AT THESE CURRENTS PROVIDE TENS OF MILLIWATTS. SEE ALSO: SURFACE-EMITTING LED.

EDGE-RESPONSE

THE ABILITY OF AN OPTICAL FIBER BUNDLE TO FORM, MAINTAIN, AND RESOLVE AN IMAGE OF A SHARPLY-OUTLINED IMAGE, I.E. A KNIFE-EDGE.

EDGE TEST

SEE: FOUCAULT KNIFE-EDGE TEST.

EFFECT

SEE: ACOUSTOOPTIC EFFECT, ELECTROOPTIC EFFECT; MAGNETOOPTIC EFFECT; PHOTOCONDUCTIVE EFFECT; PHOTOELECTRIC EFFECT; PHOTOELECTROMAGNETIC EFFECT; PHOTOEMISSIVE EFFECT; PHOTOVOLTAIC EFFECT; STARK EFFECT; ZEEMAN EFFECT.

EFFICIENCY

SEE: COUPLING EFFICIENCY; DIFFERENTIAL QUANTUM EFFICIENCY; LUMINOUS EFFICIENCY; LUMINOUS RADIATION EFFICIENCY; OPTICAL POWER EFFICIENCY; RESPONSE QUANTUM EFFICIENCY.

EFL

SEE: EQUIVALENT FOCAL LENGTH.

ELECTRIC VECTOR

A REPRESENTATION OF THE ELECTRIC FIELD ASSOCIATED WITH AN ELECTROMAGNETIC WAVE, AND HENCE WITH A LIGHT WAVE, THAT SPECIFIES THE DIRECTION AND AMPLITUDE OF THIS ELECTRIC FIELD.

ELECTROLUMINESCENCE

THE PHENOMENON IN WHICH THERE IS A DIRECT CONVERSION FROM ELECTRICAL ENERGY TO LIGHT ENERGY.

ELECTROMAGNETIC SPECTRUM

THE ENTIRE RANGE OF WAVELENGTHS, EXTENDING FROM THE SHORTEST TO THE LONGEST OR CONVERSELY, THAT CAN BE GENERATED PHYSICALLY. NOTE: THIS RANGE OF ELECTROMAGNETIC WAVELENGTHS EXTENDS ALMOST FROM ZERO TO INFINITY AND INCLUDES THE VISIBLE PORTION OF THE SPECTRUM KNOWN AS LIGHT. SEE ALSO: VISUAL SPECTRUM.

ELECTROMAGNETIC THEORY

THE THEORY OF PROPAGATION OF ENERGY BY COMBINED ELECTRIC AND MAGNETIC

FIELDS. NOTE: MUCH OF THE THEORY IS EMBODIED IN MAXWELL'S EQUATIONS.

ELECTRONIC CHARGE
THE QUANTITY OF CHARGE REPRESENTED OR POSSESSED BY ONE ELECTRON, EQUAL TO 1.6 X 10(-19) COULOMB.

ELECTRONIC DEVICE
SEE: OPTOELECTRONIC DEVICE

ELECTRON OPTICS
THE AREA OF SCIENCE DEVOTED TO THE DIRECTING AND GUIDING OF ELECTRON BEAMS USING ELECTRIC FIELDS IN THE SAME MANNER AS LENSES ARE USED ON LIGHT BEAMS; FOR EXAMPLE, IN IMAGE-CONVERTER TUBES AND ELECTRON MICROSCOPES. PERTAINING TO DEVICES WHOSE OPERATION RELIES ON MODIFICATION OF A MATERIAL'S REFRACTIVE INDEX BY ELECTRIC FIELDS. NOTE: IN A KERR CELL, THE INDEX CHANGE IS PROPORTIONAL TO THE SQUARE OF THE ELECTRIC FIELD, AND THE MATERIAL IS USUALLY A LIQUID. IN A POCKEL CELL, THE MATERIAL IS A CRYSTAL WHOSE INDEX CHANGE IS LINEAR WITH THE ELECTRIC FIELD.

ELECTROOPTIC COEFFICIENT
A MEASURE OF THE EXTENT TO WHICH THE INDEX OF REFRACTION CHANGES WITH APPLIED HIGH ELECTRIC FIELD, SUCH AS SEVERAL PARTS PER TEN THOUSAND FOR APPLIED FIELDS OF THE ORDER OF 20 VOLTS PER CENTIMETER. NOTE: SINCE THE PHASE SHIFT OF A LIGHT WAVE IS A FUNCTION OF THE INDEX OF REFRACTION OF THE MEDIUM IN WHICH IT IS PROPAGATING, THE CHANGE IN INDEX CAN BE USED TO PHASE-MODULATE THE LIGHT WAVE BY SHIFTING ITS PHASE AT A PARTICULAR POINT ALONG THE GUIDE, BY CHANGING THE PROPAGATION TIME TO THE POINT. SEE ALSO: ELECTROOPTIC PHASE MODULATION

ELECTROOPTIC EFFECT
THE CHANGE IN THE INDEX OF REFRACTION OF A MATERIAL WHEN SUBJECTED TO AN ELECTRIC FIELD. NOTE: THE EFFECT CAN BE USED TO MODULATE A LIGHT BEAM IN A MATERIAL SINCE MANY PROPERTIES, SUCH AS LIGHT CONDUCTING VELOCITIES, REFLECTION AND TRANSMISSION COEFFICIENTS AT INTERFACES, ACCEPTANCE ANGLES, CRITICAL ANGLES, AND TRANSMISSION MODES, ARE DEPENDENT UPON THE REFRACTIVE INDICES OF THE MEDIA IN WHICH THE LIGHT TRAVELS.

ELECTROOPTIC PHASE MODULATION
MODULATION OF THE PHASE OF A LIGHTWAVE, SUCH AS BY CHANGING THE INDEX OF REFRACTION AND THUS THE VELOCITY OF PROPAGATION AND HENCE THE PHASE AT A POINT IN THE MEDIUM IN WHICH THE WAVE IS PROPAGATING, IN ACCORDANCE WITH AN APPLIED FIELD SERVING AS THE MODULATING SIGNAL. SEE ALSO: ELECTROOPTIC COEFFICIENT.

ELEMENT
SEE: RECEIVING ELEMENT; TRANSMITTING ELEMENT.

EMERGENCE
PERTAINING TO THE TRIGONOMETRIC RELATION BETWEEN AN EMERGENT RAY AND THE SURFACE OF A MEDIUM. SEE: GRAZING EMERGENCE; NORMAL EMERGENCE.

EMERGENT RAY
A RAY OF LIGHT LEAVING, I.E., EMERGING FROM A MEDIUM AS CONTRASTED TO AN ENTERING OR INCIDENT RAY.

EMI
SEE: ELECTROMAGNETIC INTERFERENCE.

EMISSION
SEE: SPONTANEOUS EMISSION; STIMULATED EMISSION.

EMISSION-BEAM-ANGLE-BETWEEN-HALF-POWER-POINTS
THE ANGLE CENTERED ON THE OPTICAL AXIS OF A LIGHT-EMITTER WITHIN WHICH THE RADIANT POWER DENSITY IS EQUAL TO OR GREATER THAN HALF THE MAXIMUM POWER DENSITY (ON THE OPTICAL AXIS).

EMISSION LAW
SEE: COSINE EMISSION LAW

EMISSION OF RADIATION
SEE: MICROWAVE AMPLICATION BY STIMULATED EMISSION OF RADIATION

EMISSIVITY
THE RATIO OF THE RADIANT EMITTANCE OR RADIATED FLUX OF A SOURCE TO THE RADIANT EMITTANCE OR RADIATED FLUX OF A BLACKBODY AT THE SAME TEMPERATURE. NOTE: EMISSIVITY IS USUALLY A FUNCTION OF WAVELENGTH.

EMITTANCE
SEE: LUMINOUS EMITTANCE; RADIANT EMITTANCE.
SEE: SPECTRAL EMITTANCE.

EMITTER
SEE: OPTICAL EMITTER

EMITTING DIODE
SEE: LIGHT EMITTING DIODE.
SEE: RESTRICTED EDGE-EMITTING DIODE.

EMITTING DIODE COUPLER
SEE: LIGHT-EMITTING DIODE COUPLER.

EMITTING LED
SEE: EDGE-EMITTING LED; SURFACE-EMITTING LED.

END-FINISH
SEE: OPTICAL END-FINISH

END-FIRE COUPLING

OPTICAL FIBER AND INTEGRATED OPTICAL-CIRCUIT (IOC) COUPLING BETWEEN TWO WAVEGUIDES IN WHICH THE TWO WAVE GUIDES TO BE COUPLED ARE BUTTED UP AGAINST EACH OTHER. A MORE STRAIGHTFORWARD, SIMPLER, AND MORE EFFICIENT COUPLING METHOD THAN EVANESCENT FIELD COUPLING. NOTE: MODE PATTERN MATCHING IS REQUIRED AND ACCOMPLISHED BY MAINTAINING A UNITY CROSS-SECTIONAL AREA ASPECT RATIO, AXIAL ALIGNMENT, AND MINIMAL LATERAL AXIAL DISPLACEMENT. SEE ALSO: EVANESCENT FIELD COUPLING.

ENDOSCOPE

AN OPTICAL INSTRUMENT USED TO OBTAIN IMAGES OF, OR VIEW, INTERNAL PARTS OF A SYSTEM, SUCH AS INTERNAL CAVITIES AND ORGANS OF THE BODY. NOTE: ENDOSCOPES OFTEN USE OPTICAL FIBER BUNDLES AS TRANSMISSION CABLES.

ENERGY

SEE: RADIANT ENERGY

ENERGY DENSITY

SEE: OPTICAL ENERGY DENSITY

ENERGY LEVEL

THE DISCRETE AMOUNT (QUANTA) OF KINETIC AND POTENTIAL ENERGY POSSESSED BY AN ORBITING ELECTRON. NOTE: ENERGY (QUANTA) IS ABSORBED OR RADIATED DEPENDING ON WHETHER AN ELECTRON MOVES FROM A LOWER TO A HIGHER OR A HIGHER TO A LOWER ENERGY LEVEL.

ENTRANCE PUPIL

1. IN AN OPTICAL SYSTEM, THE IMAGE OF THE LIMITING APERTURE STOP FORMED IN THE OBJECT SPACE BY ALL OPTICAL ELEMENTS OF THE SYSTEM PRECEDING THE LIMITING APERTURE STOP. 2. THE APERTURE OF THE OBJECTIVE WHEN THERE ARE NO OTHER LIMITING STOPS FOLLOWING IT IN AN OPTICAL SYSTEM.

EQUATIONS

SEE: DISPERSION EQUATIONS

EQUIVALENT FOCAL LENGTH (EFL)

1. THE DISTANCE FROM A PRINCIPAL POINT TO ITS CORRESPONDING PRINCIPAL FOCAL POINT. 2. THE FOCAL LENGTH OF THE EQUIVALENT THIN LENS. NOTE: THE SIZE OF THE IMAGE OF AN OBJECT IS DIRECTLY PROPORTIONAL TO THE EQUIVALENT FOCAL LENGTH OF THE LENS FORMING IT.

EQUIVALENT POWER

SEE: NOISE EQUIVALENT POWER

ERECT IMAGE

IN AN OPTICAL SYSTEM, AN IMAGE, EITHER REAL OR VIRTUAL, THAT HAS THE SAME SPATIAL ORIENTATION AS THE OBJECT. NOTE: THE IMAGE OBTAINED AT THE RETINA WITH THE ASSISTANCE OF AN OPTICAL SYSTEM IS SAID TO BE ERECT WHEN THE

ORIENTATION OF THE IMAGE IS THE SAME AS WITH THE UNAIDED EYE.

ERROR RATE
SEE: BIT ERROR RATE (BER).

EVANESCENT-FIELD COUPLING
OPTICAL FIBER, OR INTEGRATED OPTICAL-CIRCUIT (IOC) COUPLING BETWEEN TWO WAVEGUIDES IN WHICH THE TWO WAVEGUIDES TO BE COUPLED ARE HELD PARALLEL TO EACH OTHER IN THE COUPLING REGION. THE EVANESCENT WAVES ON THE OUTSIDE OF THE WAVEGUIDE ENTERING THE COUPLED WAVEGUIDE BRINGING SOME OF THE LIGHT ENERGY WITH IT INTO THE COUPLED WAVEGUIDE. NOTE: CLOSE-TO-CORE PROXIMITY OR FUSION IS REQUIRED. SEE ALSO: TANGENTIAL COUPLING.

EXCHANGE PROCESS
SEE: DOUBLE-CRUCIBLE PROCESS.

EXCITED ATMOSPHERE LASER
SEE: LONGITUDINALLY-EXCITED ATMOSPHERE LASER; TRANSVERSE-EXCITED ATMOSPHERE LASER.

EXCITED STATE
ANY ORBITAL KINETIC AND POTENTIAL ENERGY STATE THAT AN ELECTRON CAN HAVE ABOVE THE GROUND STATE. SEE ALSO: GROUND STATE. NOTE: AN ELECTRON EMITS A QUANTUM OF ENERGY WHEN IT MOVES FROM AN EXICTED STATE TO THE GROUND STATE.

EXITANCE
SEE: RADIANT EXITANCE

EXIT ANGLE
WHEN A LIGHT RAY EMERGES FROM A SURFACE, THE ANGLE BETWEEN THE RAY AND A NORMAL TO THE SURFACE AT THE POINT OF EMERGENCE. NOTE: FOR AN OPTICAL FIBER, THE ANGLE BETWEEN THE OUTPUT RAY, AND THE AXIS OF THE FIBER OR FIBER BUNDLE.

EXIT PUPIL
IN AN OPTICAL SYSTEM, THE IMAGE OF THE LIMITING APERTURE STOP FORMED BY ALL LENSES FOLLOWING THIS STOP. NOTE: IN PHOTOGRAPHIC OBJECTIVES, THIS IMAGE IS VIRTUAL AND IS USUALLY NOT FAR FROM THE IRIS DIAPHRAGM: IN TELESCOPES, THE IMAGE IS REAL AND CAN BE SEEN AS A SMALL BRIGHT, CIRCULAR DISC BY LOOKING AT THE EYEPIECE OF THE INSTRUMENT DIRECTED TOWARD AN ILLUMINATED AREA OR LIGHT SOURCE; IN TELESCOPES, ITS DIAMETER IS EQUAL TO THE DIAMETER OF THE ENTRANCE PUPIL DIVIDED BY MAGNIFICATION OF THE INSTRUMENT; IN GALILEAN TELESCOPES, THE EXIT PUPIL IS A VIRTUAL IMAGE BETWEEN THE OBJECTIVE AND EYE-PIECE AND ACTS AS AN OUT-OF-FOCUS FIELD STOP.

EXTERNAL OPTICAL MODULATION
MODULATION OF A LIGHT WAVE IN A MEDIUM BY APPLICATION OF FIELDS, FORCES, WAVES, OR OTHER ENERGY FORMS UPON A MEDIUM CONDUCTING A LIGHT BEAM

IN SUCH A MANNER THAT A CHARACTERISTIC OF EITHER THE MEDIUM. OR THE BEAM. OR BOTH ARE MODULATED IN SOME FASHION. NOTE: EXTERNAL OPTICAL MODULATION CAN MAKE USE OF SUCH EFFECTS AS THE ELECTROOPTIC. ACOUSTOOPTIC. MAGNETO-OPTIC. OR ABSORPTIVE EFFECT.

EXTERNAL PHOTOEFFECT

THE EMISSION OF PHOTON-EXCITED ELECTRONS FROM THE SURFACE OF A MATERIAL AFTER OVERCOMING THE ENERGY BARRIER AT THE SURFACE OF A PHOTO-EMISSIVE MATERIAL.

EXTERNAL PHOTOEFFECT DETECTOR

A PHOTODETECTOR IN WHICH THE ENERGY OF EACH PHOTON INCIDENT ON THE DETECTOR SURFACE IS SUFFICIENT TO LIBERATE ONE OR MORE ELECTRONS. I.E.. PLANCK'S CONSTANT TIMES THE FREQUENCY. WHICH IS THE ENERGY OF THE PHOTON. IS SUFFICIENT TO OVERCOME THE WORK FUNCTION OF THE MATERIAL. AND THE LIBERATED ELECTRONS MOVE IN UNDER THE INFLUENCE OF AN APPLIED ELECTRIC FIELD. NOTE: PHOTO-EMMISIVE DEVICES MAKE USE OF THE EXTERNAL PHOTOEFFECT. SEE ALSO: INTERNAL PHOTOEFFECT DETECTOR.

EXTINCTION COEFFICIENT

THE SUM OF THE ABSORPTION COEFFICIENT AND THE SCATTERING COEFFICIENT. SEE ALSO: BOUGER'S LAW.

EXTRAMURAL ABSORPTION

THE ABSORPTION OF LIGHT. TRANSMITTED RADIALLY THROUGH THE CLADDING OF AN OPTICAL FIBER. BY MEANS OF A DARK OR OPAQUE COATING PLACED OVER THE CLADDING.

NOTE: EXTRAMURAL ABSORPTION MAY BE ACCOMPLISHED BY ANY LIGHT-ABSORBING MATERIAL. SUCH AS SECONDARY COATINGS. INTERSTITIAL FIBERS. OR OTHER JACKETS.

EXTRAMURAL CLADDING

A LAYER OF DARK OR OPAQUE ABSORBING COATING PLACED OVER THE CLADDING OF AN OPTICAL FIBER TO INCREASE INTERNAL REFLECTION. PROTECT THE SMOOTH REFLECTING WALL OF THE CLADDING. AND ABSORB SCATTERED OR ESCAPED STRAY LIGHT THAT MIGHT PENETRATE THE CLADDING.

EXTRAORDINARY RAY

A LIGHT RAY THAT HAS A NONISOTROPIC VELOCITY IN A DOUBLY REFRACTING CRYSTAL. NOTE: AN EXTRAORDINARY RAY DOES NOT NECESSARILY OBEY SNELL'S LAW UPON REFRACTION AT THE CRYSTAL SURFACE.

EXTRINSIC INTERNAL PHOTOEFFECT

AN INTERNAL PHOTOEFFECT INVOLVING THE DOPANTS OR OTHER IMPURITIES IN A BASIC (INTRINSIC) MATERIAL. SEE ALSO: INTRINSIC INTERNAL PHOTOEFFECT.

FABRY-PEROT INTERFEROMETER

A HIGH-RESOLUTION MULTIPLE-BEAM INTERFEROMETER CONSISTING OF TWO OPTICALLY FLAT AND PARALLEL GLASS OR QUARTZ PLATES HELD A SHORT FIXED DISTANCE APART. THE ADJACENT SURFACES OF THE PLATES OR INTERFEROMETER FLATS BEING MADE ALMOST TOTALLY REFLECTING BY A THIN SILVER FILM OR MULTILAYER DIELECTRIC COATING.

FACEPLATE

SEE: FIBER FACEPLATE.

FACTOR

SEE: PHOTOCONDUCTIVE GAIN FACTOR; PULSE DUTY-FACTOR.

FARADAY EFFECT

SEE: MAGNETOOPTIC EFFECT.

FAR INFRARED

PERTAINING TO ELECTROMAGNETIC WAVELENGTHS FROM 30 TO 1000 MICRONS.

FEP-CLAD SILICA FIBER

SEE: LOW-LOSS FEP-CLAD SILICA FIBER.

FERMAT PRINCIPLE

A RAY OF LIGHT FROM ONE POINT TO ANOTHER, INCLUDING REFLECTIONS AND REFRACTIONS THAT MAY OCCUR, FOLLOWS THE PATH THAT REQUIRES THE LEAST TIME. NOTE: THE OPTICAL PATH LENGTH IS AN EXTREME PATH IN THE TERMINOLOGY OF THE CALCULUS OF VARIATIONS. SYNONYM: LEAST-TIME PRINCIPLE.

FFL

SEE: FRONT FOCAL LENGTH.

FIBER

SEE: GRADED-INDEX FIBER; MULTIMODE FIBER; OPTICAL FIBER; SINGLE FIBER; SINGLE-MODE FIBER; STEP-INDEX FIBER; UNIFORM-INDEX-PROFILE FIBER.

SEE: DOPED-SILICA CLADDED FIBER; DOPED-SILICA GRADED FIBER; HIGH-LOSS FIBER; LIQUID CORE FIBER; LOW-LOSS FEP-CLAD SILICA FIBER; LOW-LOSS FIBER; MEDIUM-LOSS FIBER; OPTICAL TAPER. PLASTIC-CLAD SILICA FIBER.

FIBER ABSOPRTION

IN AN OPTICAL FIBER, THE LIGHTWAVE POWER ATTENUATION DUE TO ABSORPTION IN THE FIBER CORE MATERIAL. A LOSS USUALLY EVALUATED BY MEASURING THE POWER EMERGING AT THE END OF SUCCESSIVELY-SHORTENED KNOWN LENGTHS OF THE FIBER.

FIBER BUFFER
THE MATERIAL SURROUNDING AND IMMEDIATELY ADJACENT TO AN OPTICAL FIBER THAT PROVIDES MECHANICAL ISOLATION AND PROTECTION. NOTE: BUFFERS ARE GENERALLY SOFTER MATERIALS THAN JACKETS.

FIBER BUNDLE
SEE: OPTICAL FIBER BUNDLE.

FIBER CABLE
SEE: MULTIPLE-FIBER CABLE; MULTI-CHANNEL SINGLE-FIBER CABLE; SINGLE-CHANNEL SINGLE-FIBER CABLE.

FIBER CABLE ASSEMBLY
SEE: MULTIPLE-FIBER CABLE ASSEMBLY

FIBER CLADDING
A LIGHT-CONDUCTING MATERIAL THAT SURROUNDS THE CORE OF AN OPTICAL FIBER AND THAT HAS A LOWER REFRACTIVE INDEX THAN THE CORE MATERIAL.

FIBER COATING
SEE: OPTICAL FIBER COATING.

FIBER CORE
THE CENTRAL LIGHT-CONDUCTING PORTION OF AN OPTICAL FIBER. NOTE: THE CORE HAS A HIGHER REFRACTIVE INDEX THAN THE CLADDING THAT SURROUNDS IT.

FIBER CORE DIAMETER
IN AN OPTICAL DIBER, THE DIAMETER OF THE HIGHER REFRACTIVE INDEX MEDIUM THAT IS THE PRIMARY TRANSMISSION MEDIUM FOR THE FIBER.

FIBER COUPLING
SEE: SOURCE-FIBER COUPLING.

FIBER CROSSTALK
IN AN OPTICAL FIBER, EXCHANGE OF LIGHTWAVE ENERGY BETWEEN A CORE AND THE CLADDING, THE CLADDING AND THE AMBIENT SURROUNDING, OR BETWEEN DIFFERENTLY-INDEXED LAYERS. NOTE: FIBER CROSSTALK IS USUALLY UNDESIRABLE, SINCE DIFFERENCES IN PATH LENGTH AND PROPAGATION TIME CAN RESULT IN DISPERSION, REDUCING TRANSMISSION DISTANCES. THUS, ATTENUATION IS DELIBERATELY INTRODUCED INTO THE CLADDING BY MAKING IT LOSSY.

FIBER-DETECTOR COUPLING
IN FIBER OPTIC TRANSMISSION SYSTEMS, THE TRANSFER OF OPTICAL SIGNAL POWER FROM AN OPTICAL FIBER TO A DETECTOR FOR CONVERSION TO AN ELECTRICAL SIGNAL. NOTE: MANY OPTICAL FIBER DETECTORS HAVE AN OPTICAL FIBER PIGTAIL FOR CONNECTION BY MEANS OF A SPLICE OR A CONNECTOR TO A TRANSMISSION FIBER.

FIBER DIAMETER

THE DIMAETER OF AN OPTICAL FIBER, NORMALLY INCLUSIVE OF THE CORE, THE CLADDING IF STEP-INDEXED, AND ANY ADHERENT COATING NOT NORMALLY REMOVED WHEN MAKING A CONNECTION, SUCH AS BY A BUTTED OR TANGENTIAL CONNECTION.

FIBER DISPERSION

THE LENGTHENING OF THE WIDTH OF AN ELECTROMAGNETIC-ENERGY PULSE AS IT TRAVELS ALONG A FIBER, CAUSED BY MATERIAL DISPERSION, DUE TO THE FREQUENCY DEPENDENCE OF THE REFRACTIVE INDEX, MODAL DISPERSION, CAUSED BY DIFFERENT GROUP VELOCITIES OF THE DIFFERENT MODES, AND WAVEGUIDE DISPERSION DUE TO FREQUENCY DEPENDENCE OF THE PROPAGATION CONSTANT OF THAT MODE.

FIBER FACEPLATE

A COHERENT ARRAY OF FUSED OPTICAL FIBERS USED AS A COVER FOR A LIGHT SOURCE, SUCH AS A LED OR A VACUUM OR GAS TUBE, USUALLY CUT FROM A BOULE. SEE ALSO: BOULE.

FIBER JACKET

SEE: OPTICAL FIBER JACKET.

FIBER JUNCTION

SEE: OPTICAL FIBER JUNCTION.

FIBER LIGHT-GUIDE

SEE: OPTICAL FIBER.

FIBER LOSS

SEE: SOURCE-TO-FIBER LOSS.

FIBER-OPTIC CABLE

OPTICAL FIBERS INCORPORATED INTO AN ASSEMBLY OF MATERIALS THAT PROVIDES TENSILE STRENGTH, EXTERNAL PROTECTION, AND HANDLING PROPERTIES COMPARABLE TO THOSE OF EQUIVALENT-DIAMETER COAXIAL CABLES. NOTE: FIBER-OPTIC CABLES (LIGHT GUIDES) ARE A DIRECT REPLACEMENT FOR CONVENTIONAL COAXIAL CABLES AND WIRE PAIRS. THE GLASS-BASED TRANSMISSION FACILITIES OCCUPY FAR LESS PHYSICAL VOLUME FOR AN EQUIVALENT TRANSMISSION CAPACITY, WHICH IS A MAJOR ADVANTAGE IN CROWDED UNDERGROUND DUCTS. IN ADDITION IT MAY BE THAT THEY CAN BE MANUFACTURED FOR FAR LESS AND THAT INSTALLATION AND MAINTENANCE COSTS CAN BE LESS. THESE ADVANTAGES, WITH THE REDUCED USE OF CRITICAL METALS, SUCH AS COPPER, IS A STRONG IMPETUS FOR RAPID DEVELOPMENT OF LIGHTWAVE COMMUNICATION SYSTEMS.

FIBER-OPTIC COMMUNICATIONS (FOC)

COMMUNICATION SYSTEMS AND COMPONENTS IN WHICH OPTICAL FIBERS ARE USED TO CARRY SIGNALS FROM POINT TO POINT.

FIBER-OPTIC CONNECTOR

SEE: FIXED FIBER-OPTIC CONNECTOR; FREE FIBER-OPTIC CONNECTOR.

FIBER-OPTIC MULTIPORT COUPLER

AN OPTICAL UNIT, SUCH AS A SCATTERING OR DIFFUSION SOLID "CHAMBER" OF OPTICAL MATERIAL, THAT HAS ATLEAST ONE INPUT AND TWO OUTPUTS, OR ATLEAST TWO INPUTS AND ONE OUTPUT, THAT CAN BE USED TO COUPLE VARIOUS SOURCES TO VARIOUS RECEIVERS. NOTE: THE PORTS ARE USUALLY OPTICAL FIBERS. IF THERE IS ONLY ONE INPUT AND ONE OUTPUT PORT, IT IS SIMPLY A CONNECTOR.

FIBER-OPTIC PROBE

A FLEXIBLE PROBE MADE UP OF A BUNDLE OF FINE GLASS FIBERS OPTICALLY ALIGNED TO TRANSMIT AN IMAGE.

FIBER-OPTIC ROD COUPLER

A GRADED-INDEX CYLINDRICALLY-SHAPED SECTION OF OPTICAL FIBER OR ROD WITH A LENGTH CORRESPONDING TO THE PITCH OF THE UNDULATIONS OF LIGHTWAVES CAUSED BY THE GRADED REFRACTIVE INDEX, THE LIGHT BEAM BEING INJECTED VIA FIBERS AT AN OFF-AXIS END-POINT ON THE RADIUS, WITH THE UNDULATIONS OF THE RESULTING WAVE VARYING PERIODICALLY FROM ONE POINT TO ANOTHER ALONG THE ROD AND WITH HALF-REFLECTION LAYERS AT THE 1/4 - PITCH POINT OF THE UNDULATIONS PROVIDING FOR COUPLING BETWEEN INPUT AND OUTPUT FIBERS.

FIBER-OPTIC ROD MULTIPLEXER-FILTER

A GRADED-INDEX CYLINDRICALLY-SHAPED SECTION OF OPTICAL FIBER OR ROD WITH A LENGTH CORRESPONDING TO THE PITCH OF THE UNDULATIONS OF LIGHTWAVES CAUSED BY THE GRADED REFRACTIVE INDEX, THE LIGHT BEAM BEING INJECTED VIA FIBERS AT AN OFF-AXIS END-POINT ON THE RADIUS, WITH THE UNDULATIONS OF THE RESULTING WAVE VARYING PERIODICALLY FROM ONE POINT TO ANOTHER ALONG THE ROD AND WITH INTERFERENCE LAYERS AT THE 1/4 - PITCH POINT OF THE UNDULATIONS, PROVIDING FOR MULTIPLEXING OR FILTERING.

FIBER OPTICS (FO)

THE TECHNOLOGY OF GUIDANCE OF OPTICAL POWER, INCLUDING RAYS AND WAVE GUIDE MODES OF ELECTROMAGNETIC WAVES ALONG CONDUCTORS OF ELECTROMAGNETIC WAVES IN THE VISIBLE AND NEAR-VISIBLE REGION OF THE FREQUENCY SPECTRUM, SPECIFICALLY WHEN THE OPTICAL ENERGY IS GUIDED TO ANOTHER LOCATION THROUGH THIN TRANSPARENT STRANDS. NOTE: TECHNIQUES INCLUDE CONVEYING LIGHT OR IMAGES THROUGH A PARTICULAR CONFIGURATION OF GLASS OR PLASTIC FIBERS. INCOHERENT OPTICAL FIBERS WILL TRANSMIT LIGHT, AS A PIPE WILL TRANSMIT WATER, BUT NOT AN IMAGE. COHERENT OPTICAL FIBERS CAN TRANSMIT AN IMAGE THROUGH PERFECTLY ALIGNED, SMALL (10-12 MICRONS) CLAD OPTICAL FIBERS. SPECIALTY FIBER OPTICS COMBINE COHERENT AND INCOHERENT ASPECTS.

SEE: ULTRAVIOLET FIBER OPTICS.

FIBER-OPTIC SCRAMBLER

SIMILAR TO A FIBERSCOPE EXCEPT THAT THE MIDDLE SECTION OF LOOSE FIBER IS DELIBERATELY DISORIENTED AS MUCH AS POSSIBLE, THEN POTTED AND SAWED. EACH HALF IS THEN CAPABLE OF CODING A PICTURE THAT CAN BE DECODED BY THE OTHER HALF.

FIBER-OPTIC SPLICE

A NON-SEPARABLE JUNCTION JOINING ONE OPTICAL CONDUCTOR TO ANOTHER.

FIBER-OPTIC TERMINUS

A DEVICE, USED TO TERMINATE AN OPTICAL CONDUCTOR, THAT PROVIDES A MEANS TO LOCATE AND CONTAIN AN OPTICAL CONDUCTOR WITHIN A CONNECTOR.

FIBER OPTIC TRANSMISSION SYSTEM (FOTS)

A TRANSMISSION SYSTEM UTILIZING SMALL DIAMETER TRANSPARENT FIBERS THROUGH WHICH LIGHT IS TRANSMITTED. NOTE: INFORMATION IS TRANSFERRED BY MODULATING THE TRANSMITTED LIGHT. THESE MODULATED SIGNALS ARE DETECTED BY LIGHT-SENSITIVE DEVICES, I.E., PHOTODETECTORS. SEE: LASER FIBER-OPTIC TRANSMISSION SYSTEM.

FIBER-OPTIC WAVEGUIDE

A RELATIVELY LONG THIN STRAND OF TRANSPARENT SUBSTANCE, USUALLY GLASS, CAPABLE OF CONDUCTING AN ELECTROMAGNETIC WAVE OF OPTICAL WAVELENGTH (VISIBLE OR NEAR-VISIBLE REGION OF THE FREQUENCY SPECTRUM) WITH SOME ABILITY TO CONFINE LONGITUDINALLY DIRECTED, OR NEAR-LONGITUDINALLY-DIRECTED, LIGHT WAVES, TO ITS INTERIOR BY MEANS OF INTERNAL REFLECTION. NOTE: THE FIBER-OPTIC WAVEGUIDE MAY BE HOMOGENEOUS OR RADIALLY INHOMOGENEOUS WITH STEP OR GRADED CHANGES IN ITS INDEX OF REFRACTION, THE INDICES BEING LOWER AT THE OUTER REGIONS, THE CORE THUS BEING OF INCREASED INDEX OF REFRACTION.

FIBER PREFORM

SEE: OPTICAL FIBER PREFORM.

FIBER SCATTERING

IN AN OPTICAL FIBER, THE COUPLING, OR LEAKING, OF LIGHTWAVE POWER OUT OF THE CORE OF THE FIBER BY RAYLEIGH SCATTERING OR GUIDE IMPERFECTIONS SUCH AS DIELECTRIC STRAIN, COMPOSITIONAL OR PHYSICAL DISCONTINUTIES IN THE CORE OR CLADDING, IRREGULARITIES AND EXTRANEOUS INCLUSIONS IN THE CORE-CLADDING INTERFACE, CURVATURE OF THE OPTICAL AXIS, OR TAPERING. NOTE: SCATTERING LOSSES ARE MEASURED IN ALL DIRECTIONS AS AN INTEGRATED EFFECT AND EXPRESSED IN DB/KM.

FIBERSCOPE

A DEVICE CONSISTING OF AN ENTRY POINT, AT WHICH A BUNDLE OF OPTICAL FIBERS CAN ENTER, AND A FACEPLATE SURFACE, ON WHICH THE ENTERING FIBERS CAN UNIFORMLY TERMINATE, IN ORDER TO DISPLAY THE OPTICAL IMAGE RECEIVED THROUGH THE FIBERS. NOTE: THE BUNDLE OF FIBERS TRANSMIT A FULL COLOR IMAGE THAT REMAINS UNDISTURBED WHEN THE BUNDLE IS BENT. BY MOUNTING AN OBJECTIVE LENS ON ONE END OF THE BUNDLE, AND AN EYEPIECE AT THE OTHER, THE ASSEMBLY BECOMES A FLEXIBLE FIBERSCOPE THAT CAN BE USED TO VIEW OBJECTS THAT OTHERWISE WOULD BE INACCESSIBLE FOR DIRECT VIEWING.

FIBER TRANSFER FUNCTION

SEE: OPTICAL FIBER TRANSFER FUNCTION.

FIBER TRAP

SEE: OPTICAL FIBER TRAP.

FIELD
SEE: VIEW FIELD.

FIELD COUPLING
SEE: EVANESCENT-FIELD COUPLING.

FIELD CURVATURE
IN OPTICS, AN ABERRATION OF ACTIONS THAT CAUSES A PLANE IMAGE, I.E. A FLAT IMAGE, TO BE FOCUSSED ONTO A CURVED SURFACE INSTEAD OF A FLAT PLANE.

FIELD LENS
IN AN OPTICAL SYSTEM OR INSTRUMENT, A POSITIVE LENS USED TO COLLECT THE CHIEF RAYS, I.E. FIELD RAYS, OF IMAGE FORMING BUNDLES SO THAT THE ENTIRE BUNDLES, OR SUFFICIENT PORTIONS OF THEM, WILL PASS THROUGH THE EXIT PUPIL OF THE INSTRUMENT. NOTE: A FIELD LENS IS USUALLY LOCATED AT OR NEAR THE FOCAL POINT OF THE OBJECTIVE LENS. THE FIELD LENS INCREASES THE SIZE OF THE FIELD THAT CAN BE VIEWED WITH ANY GIVEN EYELENS DIAMETER.

FIELD RAYS
IN THE OBJECT SPACE OF A SYMMETRICAL OPTICAL SYSTEM, A RAY THAT INTERSECTS THE OPTICAL AXIS AT THE CENTER OF THE ENTRANCE PUPIL OF THE OPTICAL SYSTEM. NOTE: IN THE IMAGE SPACE, THE SAME RAY EMERGES FROM THE EXIT PUPIL. IN A THICK LENS, A FIELD RAY IS A PRINCIPAL RAY.

FILM
SEE: MULTILAYER DIELECTRIC FILM; PHOTOCONDUCTIVE FILM.

FILM OPTICAL MODULATOR
SEE: THIN-FILM OPTICAL MODULATOR.

FILM OPTICAL MULTIPLEXERS
SEE: THIN-FILM OPTICAL MULTIPLEXERS.

FILM OPTICAL SWITCH
SEE: THIN-FILM OPTICAL SWITCH.

FILM OPTICAL WAVEGUIDE
SEE: THIN-FILM OPTICAL WAVEGUIDE.

FILTER
IN AN OPTICAL SYSTEM, A DEVICE WITH THE DESIRED CHARACTERISTICS OF SELECTIVE TRANSMITTANCE AND OPTICAL HOMOGENEITY, USED TO MODIFY THE SPECTRAL COMPOSITION OF RADIANT LIGHT FLUX. NOTE: A FILTER IS USUALLY OF SPECIAL GLASS, GELATIN, OR PLASTIC OPTICAL PARTS WITH PLANE PARALLEL SURFACES THAT ARE PLACED IN THE PATH OF LIGHT THROUGH THE OPTICAL SYSTEM OF AN INSTRUMENT TO SELECTIVELY ABSORB CERTAIN WAVELENGTHS OF LIGHT, REDUCE GLARE, OR REDUCE LIGHT INTENSITY. COLORED, ULTRAVIOLET, NEUTRAL DENSITY, AND POLARIZING FILTERS ARE IN COMMON USE. FILTERS MAY BE SEPARATE ELEMENTS OR INTEGRAL DEVICES MOUNTED

SO THAT THEY CAN BE PLACED IN OR OUT OF POSITION IN A SYSTEM AS DESIRED. SEE: FIBER-OPTIC ROD MULTIPLEXER-FILTER.
SEE: DICHROIC FILTER; OPTICAL FILTER.

FILTER-COUPLER-SWITCH-MODULATOR
SEE: INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR.

FINISH
SEE: OPTICAL END-FINISH.

FINISHED LENS
A LENS HAVING BOTH SURFACES GROUND AND POLISHED TO SPECIFIC DIOPTRIC POWER OR FOCUS.

FIVE-LAYER FOUR-HETEROJUNCTION DIODE
A FOUR-HETEROJUNCTION LASER DIODE, CONSISTING OF TWO PAIRS OF HETEROJUNCTIONS, THAT HAS FIVE LAYERS OF STEP-INDEXED MATERIAL, I.E. FIVE LAYERS OF MATERIAL WITH A SUDDEN TRANSITION OF REFRACTIVE INDEX AT THE INTERFACE BETWEEN LAYERS, SO AS TO CONFINE THE EMITTED LIGHT TO A NARROW BEAM FOR OPTIMUM COUPLING TO AN OPTICAL FIBER, FIBER BUNDLE, OR INTEGRATED OPTICAL CIRCUIT. NOTE: USUALLY ONLY THREE DIFFERENT REFRACTIVE INDICES ARE INVOLVED, SINCE THERE MAY BE A PAIR OF IDENTICALLY-INDEXED OUTSIDE LAYERS, A PAIR OF IDENTICALLY-INDEXED INSIDE LAYERS ON OPPOSITE SIDES OF A CENTER LAYER, EACH PAIR AND CENTER LAYER BEING OF DIFFERENT REFRACTIVE INDEX, WITH DECREASED REFRACTIVE INDICES TOWARD THE OUTSIDE, RESULTING IN A LAYERED CROSS-SECTION WITH STEP-INDICES OF N(1) : N(2) : N(3) : N(2) N(1), WITH N(1) LESS THAN N(3). THUS, ALMOST ALL OF THE GENERATED AND EMITTED LIGHT IS CONFINED TO THE CENTER LAYER BY INTERNAL REFLECTION.

FIXED FIBER-OPTIC CONNECTOR
A CONNECTOR THAT PERMITS CONNECTION OF OPTICAL FIBER COMPONENTS THAT ARE TO BE ASSOCIATED ON A PERMANENT BASIS. NOTE: FIXED FIBER-OPTIC CONNECTORS CAN BE USED TO CONNECT SOURCE TO OPTICAL CONDUCTOR, OPTICAL CONDUCTOR TO OPTICAL CONDUCTOR, OR OPTICAL CONDUCTOR TO DETECTOR. THEY ARE USUALLY PART OF THE DEVICES BEING CONNECTED.

FIXED FOCUS
PERTAINING TO INSTRUMENTS THAT ARE NOT PROVIDED WITH A MEANS OF FOCUSSING.

FIXED OPTICAL ATTENUATOR
A DEVICE THAT ATTENUATES THE INTENSITY OF LIGHT WAVES, WHEN INSERTED INTO AN OPTICAL WAVEGUIDE LINK, A FIXED OR GIVEN NUMBER OF DB, FOR EXAMPLE, A STANDARD FIXED SINGLE ATTENUATION OF 3, 6, 10, 20, OR 40 DB FOR EACH ATTENUATOR.

FLIP CHIP
IN FIBER OPTIC CIRCUITS AND INTEGRATED OPTICAL CIRCUITS (IOC) AN OPTICAL SWITCH DESIGNED TO CONTROL LIGHT CONDUCTION PATHS INTO AND OUT OF A JUNCTION. SEE ALSO: OPTICAL SWITCH.

FLUX
A CONTRACTION FOR RADIANT FLUX OR LUMINOUS FLUX.
SEE: LUMINOUS FLUX; RADIANT FLUX.

FO
SEE: FIBER OPTICS.

FOC
SEE: FIBER-OPTIC COMMUNICATIONS.

FOCAL LENGTH
THE DISTANCE FROM A LENS, OR SOME POINT THEREIN, OR FROM A MIRROR, TO THE IMAGE OF A SMALL, INFINITELY DISTANT SOURCE OF LIGHT. NOTE: THIS IMAGE POINT IS REFERRED TO AS THE FOCAL POINT.
SEE: BACK FOCAL LENGTH; EQUIVALENT FOCAL LENGTH; FRONT FOCAL LENGTH.

FOCAL PLANE
IN AN OPTICAL SYSTEM, A PLANE THROUGH THE FOCAL POINT PERPENDICULAR TO THE PRINCIPAL AXIS OF THE SYSTEM, SUCH AS A LENS OR MIRROR. FOR EXAMPLE, THE FILM PLANE IN A CAMERA FOCUSSED AT INFINITY.

FOCAL POINT
1. IN AN OPTICAL SYSTEM, THE POINT AT WHICH A BUNDLE OF RAYS FORM A SHARP IMAGE OF AN OBJECT. 2. THE POINT AT WHICH AN OBJECT IN AN OPTICAL SYSTEM MUST BE PLACED FOR A SHARP IMAGE TO BE OBTAINED. SYNONYM: PRINCIPAL FOCUS.

FOCUS
IN AN OPTICAL SYSTEM, TO ADJUST THE SYSTEM, SUCH AS THE EYEPIECE OR OBJECTIVE OF A MICROSCOPE, TELESCOPE, OR CAMERA, SO THAT THE IMAGE IS CLEARLY SEEN BY THE OBSERVER OR SO THAT A SHARP, DISTINCT IMAGE IS REGISTERED. SEE: FIXED FOCUS; FOCAL POINT.

FOCUS POINT
SEE: PRINCIPAL FOCUS POINT.

FOOT-CANDLE
A UNIT OF ILLUMINANCE EQUAL TO ONE LUMEN INCIDENT PER SQUARE FOOT. NOTE: IT IS THE ILLUMINANCE OF A SURFACE PLACED ONE FOOT FROM A LIGHT SOURCE HAVING A LUMINOUS INTENSITY OF ONE CANDLE OR CANDELA.

FOTS
SEE: FIBER OPTICS TRANSMISSION SYSTEM.

FOUCAULT KNIFE-EDGE TEST
A METHOD OF DETERMINING THE ERRORS IN AN IMAGE OF A POINT SOURCE BY PARTIALLY OCCLUDING THE LIGHT FROM AN IMAGE BY MEANS OF A KNIFE EDGE. THE

SAME TEST MAY BE USED TO MEASURE THE ERRORS IN REFRACTING OR REFLECTING SURFACES.

FOUR-HETEROJUNCTION DIODE

A LASER DIODE WITH TWO DOUBLE HETEROJUNCTIONS, I.E. TWO PAIRS OF HETEROJUNCTIONS TO PROVIDE IMPROVED CONTROL OF DIRECTION OF RADIATION AND RADIATIVE RECOMBINATION. SYNONYM: SYMMETRICAL DOUBLE-HETEROJUNCTION DIODE. SEE: FIVE-LAYER FOUR-HETEROJUNCTION DIODE.

FRACTION

SEE: PACKING FRACTION.

FRACTION LOSS

SEE: PACKING FRACTION LOSS.

FREE FIBER-OPTIC CONNECTOR

A CONNECTOR THAT PERMITS CONNECTION OF OPTICAL FIBER COMPONENTS THAT ALSO PERMITS EASY DISCONNECTION. NOTE: FREE FIBER-OPTIC CONNECTORS CAN BE USED TO CONNECT SOURCE TO OPTICAL CONDUCTOR, OPTICAL CONDUCTOR TO OPTICAL CONDUCTOR, OR OPTICAL CONDUCTOR TO DETECTOR. THEY MAY BE CABLE MOUNTED, BUT ARE INDEPENDENT OF COMPONENTS.

FREQUENCY

SEE: CUT-OFF FREQUENCY; TRANSITION FREQUENCY.

FREQUENCY DIVISION MULTIPLEX

SEE: WAVELENGTH DIVISION MULTIPLEX.

FRESNEL REFLECTANCE LOSS

SEE: FRESNEL REFLECTION LOSS.

FRESNEL REFLECTION LOSS

THE POWER LOSS INCURRED AT AN INTERFACE SURFACE WHEN AN ELECTROMAGNETIC WAVE IS INCIDENT UPON IT AND PART OF THE INCIDENT POWER IS REFLECTED. NOTE: THE REFLECTION LOSS DEPENDS ON MANY FACTORS, INCLUDING THE INDICES OF REFRACTION OF THE INCIDENT AND REFRACTING MEDIA, THE WAVELENGTH, THE ANGLE OF INCIDENCE, AND THE INCIDENT LIGHT POLARIZATION RELATIVE TO THE INTERFACE. NOTE: REFLECTION LOSSES THAT ARE INCURRED AT THE INPUT AND OUTPUT OF AN OPTICAL FIBER ARE DUE TO THE DIFFERENCE IN REFRACTIVE INDEX BETWEEN THE FIBER AND THE MEDIUM FROM WHICH THE LIGHT ENTERS AND TO WHICH IT LEAVES. SYNONYM: FRESNEL REFLECTANCE LOSS. SEE ALSO: REFLECTION COEFFICIENT; TRANSMISSION COEFFICIENT.

FRINGE

IN OPTICS, A LIGHT OR DARK BAND CAUSED BY INTERFERENCE OF TWO OR MORE ELECTROMAGNETIC WAVES, USUALLY LIGHT WAVES, SO THAT AREAS (BANDS) OF RE-INFORCEMENT AND CANCELLATION OCCUR. SEE: NEWTON'S FRINGES.

FRONT-EMITTING LED
SEE: SURFACE-EMITTING LED.

FRONT FOCAL LENGTH (FFL)
IN AN OPTICAL SYSTEM, THE DISTANCE MEASURED FROM THE PRINCIPAL FOCUS LOCATED IN THE FRONT SPACE, TO THE FIRST PRINCIPAL POINT.

FRONT-SURFACE MIRROR
AN OPTICAL MIRROR ON WHICH THE REFLECTING SURFACE IS APPLIED TO THE FRONT SURFACE OF THE MIRROR INSTEAD OF THE BACK, I.E. TO THE SURFACE OF FIRST INCIDENCE. NOTE: THE REFLECTED LIGHT DOES NOT PASS THROUGH ANY SUBSTRATE. SEE ALSO: BACK SURFACE MIRROR.

FUNCTION
SEE: MODULATION TRANSFER FUNCTION.
OPTICAL FIBER TRANSFER FUNCTION.

FURCATION COUPLING
THE MIXING OF SIGNALS FROM SEVERAL SEPARATE OPTICAL FIBERS BY PASSING THEM THROUGH A COMMON SINGLE FIBER ROD THUS OBTAINING A SIGNAL CONTAINING ALL THE COMPONENTS OF THE SEVERAL SIGNALS. NOTE: THE MIXING OF SEVERAL COLORS CAN TAKE PLACE IN THIS MANNER.

FUSION SPLICING
IN OPTICAL TRANSMISSION SYSTEMS USING SOLID MEDIA, THE JOINING TOGETHER OF TWO MEDIA BY BUTTING THE MEDIA TOGETHER, FORMING AN INTERACE BETWEEN THEM, AND THEN REMOVING THE COMMON SURFACES SO THAT THERE BE NO INTERFACE BETWEEN THEM WHEN A LIGHT WAVE IS PROPAGATED FROM ONE MEDIUM TO THE OTHER, THUS NO REFLECTION OR REFRACTION AT THE FORMER INTERFACE CAN OCCUR.

G

GAIN-BANDWIDTH PRODUCT
THE PRODUCT OF THE GAIN OF AN ACTIVE DEVICE AND A SPECIFIED BANDWIDTH. NOTE: FOR AN AVALANCHE PHOTODIODE, THE GAIN-BANDWIDTH PRODUCT IS THE GAIN TIMES THE FREQUENCY OF MEASUREMENT WHEN THE DEVICE IS BIASED FOR MAXIMUM OBTAINABLE GAIN.

GAIN FACTOR
PHOTOCONDUCTIVE GAIN FACTOR

GAP LOSS

IN A FIBER-OPTIC SYSTEM, A POWER LOSS, EXPRESSED IN DECIBELS (DB), DUE TO THE LONGITUDINAL DEVIATION FROM OPTIMUM SPACING FROM THE LIGHT SOURCE TO THE FIBER JUNCTION FROM FIBER TO FIBER JUNCTION, OR FROM FIBER TO DETECTOR JUNCTION.

GARNET SOURCE
SEE: YAG/LED SOURCE.

GAS LASER
A LASER IN WHICH THE ACTIVE MEDIUM IS A GAS. NOTE: TYPES OF LASERS INCLUDE THE ATOMIC LASER, SUCH AS THE HELIUM-NEON LASER; THE IONIC LASER, SUCH AS THE ARGON, KRYPTON, AND XENON LASERS; THE METAL-VAPOR LASER, SUCH AS THE HELIUM-CADMIUM AND HELIUM-SELENIUM LASERS; AND THE MOLECULAR LASER, SUCH AS THE CARBON-DIOXIDE, HYDROGEN-CYANIDE AND WATER-VAPOR LASERS. SEE: MIXED-GAS LASER.

GAUSSIAN-SHAPED PULSE
A PULSE THAT HAS THE SHAPE OF A GAUSSIAN OR NORMAL DISTRIBUTION CURVE. NOTE: IN THE TIME DOMAIN, THE SHAPE IS R(T) = B EXP (-AT(2)) WHERE A AND B ARE CONSTANTS IN TIME. A SIMILAR EXPRESSION WOULD HOLD IN THE FREQUENCY DOMAIN WITH T REPLACED BY F. THE (2) INDICATES THE T IS SQUARED.

GEOMETRIC IMAGE
PERTAINING TO THE LOCATION AND SHAPE OF THE IMAGE OF A PARTICLE, AS PREDICTED BY GEOMETRIC OPTICS ALONE. NOTE: THE GEOMETRIC IMAGE IS TO BE DISTINGUISHED FROM THE DIFFRACTION IMAGE, DETERMINED FROM CONSIDERATIONS OF BOTH PHYSICAL AND GEOMETRICAL OPTICS. WITH COMPLETELY CORRECTED OBJECTIVES, THE GEOMETRICAL IMAGE OF TWO POINTS IS AGAIN TWO POINTS, BUT THE ACTUAL IMAGE OR THE DIFFRACTION IMAGE MAY OR MAY NOT SUGGEST THE PRESENCE OF AN OBJECT COMPRISED OF TWO POINTS OR TWO SMALL PARTICLES.

GEOMETRIC OPTICS
THE OPTICS OF LIGHT RAYS, THAT FOLLOW MATHEMATICALLY DEFINED PATHS IN PASSING THROUGH OPTICAL ELEMENTS SUCH AS LENSES AND PRISMS AND OPTICAL MEDIA THAT REFRACT, REFLECT, OR TRANSMIT ELECTROMAGNETIC RADIATION.
THE BRANCH OF SCIENCE THAT TREATS LIGHT PROPRAGATION IN TERMS OF RAYS, CONSIDERED AS STRAIGHT OR CURVED LINES IN HOMOGENEOUS AND NON-HOMOGENEOUS MEDIA.

GHOST IMAGE
A SPURIOUS SINGLE OR MULTIPLE IMAGE OF OBJECTS SEEN IN OPTICAL INSTRUMENTS, CAUSED BY REFLECTIONS FROM OPTICAL SURFACES. NOTE: BY COATING OPTICAL SURFACES WITH LOW REFLECTION FILMS, THE GHOST IMAGES ARE GREATLY REDUCED.

GLASS
SEE: MAGNIFIER.

GLASS LASER

A SOLID-STATE LASER WHOSE ACTIVE LASER MEDIUM IS GLASS.

G-LINE
SEE: GOUBAU LINE.

GOUBAU LINE
A SINGLE-WIRE OPEN WAVE GUIDE. NOTE: THE GOUBAU LINE IS CAPABLE OF GUIDING AN AXIAL CYLINDRICAL SURFACE WAVE. SYNONYM: G-LINE.

GRADED FIBER
SEE: DOPED-SILICA GRADED FIBER.

GRADED-INDEX FIBER
AN OPTICAL FIBER WITH A VARIABLE REFRACTIVE INDEX THAT IS A FUNCTION OF THE RADIAL DISTANCE FROM THE FIBER AXIS, THE REFRACTIVE INDEX GETTING PROGRESSIVELY LOWER AWAY FROM THE AXIS. NOTE: THIS CHARACTERISTIC CAUSES THE LIGHT RAYS TO BE CONTINUALLY REFOCUSSED BY REFRACTION INTO THE CORE. NOTE: AS A RESULT, THERE IS A DESIGNED CONTINUOUS CHANGE IN REFRACTIVE INDEX BETWEEN THE CORE AND CLADDING ALONG A FIBER DIAMETER. SEE ALSO: UNIFORM INDEX PROFILE.

GRADED-INDEX PROFILE
THE CONDITION OF HAVING THE REFRACTIVE INDEX OF A MATERIAL, SUCH AS AN OPTICAL FIBER, VARY CONTINUOUSLY FROM ONE VALUE AT THE CORE TO ANOTHER AT THE OUTER SURFACE.

GRADUAL DEGRADATION
IN A LIGHT-EMITTING DIODE (LED), A REDUCTION IN THE EXTERNALLY MEASURED QUANTUM EFFICIENCY. NOTE: IN A LASER DIODE, THE THRESHOLD CURRENT DENSITY INCREASES AND THE RESULTING INCREMENTAL QUANTUM EFFICIENCY DECREASES, RESULTING IN REDUCED POWER OUTPUT FOR GIVEN CURRENT DENSITY WITHOUT EVIDENCE OF FACET DAMAGE, HOWEVER, THE POWER OUTPUT LEVEL CAN USUALLY BE RESTORED BY AN INCREASE IN THE CURRENT DENSITY. SEE ALSO: CATASTROPHIC DEGRADATION.

GRATING
SEE: DIFFRACTION GRATING.

GRATING CHROMATIC RESOLVING POWER
THE RESOLVING POWER THAT DETERMINES THE MINIMUM WAVELENGTH DIFFERENCE FOR ANY SPECTRAL ORDER THAT CAN BE DISTINGUISHED AS SEPARATE. NOTE: THE CHROMATIC RESOLVING POWER FOR DIFFRACTION GRATINGS IS USUALLY STATED FOR CASES IN WHICH PARALLEL RAYS OF LIGHT ARE INCIDENT UPON THE GRATING AND IS NUMERICALLY EQUAL TO THE NUMBER OF LINES OR RULED SPACINGS PER UNIT DISTANCE IN THE GRATING. SEE ALSO: DIFFRACTION GRATING SPECTRAL ORDER.

GRATING SPECTRAL ORDER
SEE: DIFFRACTION GRATING SPECTRAL ORDER.

GRAZING EMERGENCE
IN OPTICS, A CONDITION IN WHICH AN EMERGENT RAY MAKES AN ANGLE OF 90-DEGREES TO THE NORMAL OF THE EMERGENT SURFACE OF A MEDIUM. SEE ALSO: EMERGENCE; NORMAL EMERGENCE.

GRAZING INCIDENCE
PERTAINING TO LIGHT RAYS INCIDENT AT 90-DEGREES TO THE NORMAL TO THE INCIDENT SURFACE. SEE ALSO: NORMAL INCIDENCE.

GROUND STATE
THE LOWEST ORBITAL KINETIC AND POTENTIAL ENERGY STATE THAT AN ELECTRON OF A GIVEN ELEMENT CAN HAVE. SEE ALSO: EXCITED STATE: NOTE: AN ELECTRON ABSORBS A QUANTUM OF ENERGY WHEN IT MOVES FROM THE GROUND STATE TO AN EXCITED STATE.

GROUP-DELAY SPREAD
SEE: MULTIMODE GROUP-DELAY SPREAD.

GUIDE
SEE: LIGHT GUIDE.
SEE: ULTRAVIOLET LIGHT GUIDE.

GUIDED MODE
SEE: CLADDING.

H

HALF-POWER POINTS
SEE: EMISSION-BEAM-ANGLE BETWEEN-HALF-POWER-POINTS

HARNESS
SEE: OPTICAL HARNESS

HARNESS ASSEMBLY
SEE: OPTICAL HARNESS ASSEMBLY.

HARNESS RUN
SEE: CABLE RUN.

HEAD

SEE: LASER HEAD.

HEAVY SEEDING

IN AN OPTICAL MEDIUM, SUCH AS GLASS, PERTAINING TO A CONDITION IN WHICH THE FINE AND COARSE SEEDS ARE VERY NUMEROUS, SUCH AS 25 OR MORE TO THE SQUARE INCH.

HETEROEPITAXIAL OPTICAL WAVEGUIDE

AN OPTICAL-WAVELENGTH ELECTROMAGNETIC WAVE GUIDE CONSISTING OF AN OPTICAL QUALITY CRYSTAL SUBSTRATE UPON WHICH ARE DEPOSITED ONE OR MORE LAYERS OF SUBSTANCES WITH DIFFERENT INDICES OF REFRACTION, SUCH AS CUBIC HETEROEPITAXIAL FILMS OF ZINC SULPHIDE (ZNS) ON GALIUM ARSENIDE (GAAS) SUBSTRATE, AND ZINC SELENIDE (ZNSE) ON GALIUM ARSENIDE (GAAS), WITH CLOSELY MATCHED LATTICE STRUCTURES AND INDICES OF REFRACTION LESS THAN THAT OF THE SUBSTRATE, SO THAT THE FILMS THEMSELVES DO NOT ACT AS ORDINARY WAVEGUIDES WITH TOTAL INTERNAL REFLECTION, BUT OPTICAL PROPAGATION OF LEAKY MODES DOES OCCUR, WITH ATTENUATION LOSSES INVERSELY PROPORTIONAL TO THE SQUARE OF THE WAVELENGTH.

HETEROJUNCTION

IN A LASER DIODE, A BOUNDARY SURFACE AT WHICH A SUDDEN TRANSITION OCCURS IN MATERIAL COMPOSITION ACROSS THE BOUNDARY, SUCH AS A CHANGE IN THE REFRACTIVE INDEX AS WELL AS A CHANGE FROM A POSITIVELY-DOPED (P) REGION TO A NEGATIVELY-DOPED (N) REGION, I.E. A P-N JUNCTION, IN A SEMICONDUCTOR, OR A POSITIVELY DOPED REGION WITH A RAPID CHANCE IN DOPING LEVEL, I.E. A HIGH CONCENTRATION GRADIENT OF DOPANT, VERSUS DISTANCE, AND USUALLY AT WHICH A CHANGE IN GEOMETRIC CROSS-SECTION OCCURS AND ACROSS WHICH A VOLTAGE OR VOLTAGE BARRIER MAY EXIST. NOTE: HETEROJUNCTIONS PROVIDE A CONTROLLED DEGREE AND DIRECTION OF RADIATION CONFINEMENT, THERE USUALLY BEING AN EQUAL REFRACTIVE INDEX STEP AT EACH HETEROJUNCTION. SEE: DOUBLE HETEROJUNCTION; SINGLE HETEROJUNCTION.

HETEROJUNCTION DIODE

SEE: DOUBLE HETEROJUNCTION DIODE; FIVE-LAYER FOUR-HETEROJUNCTION DIODE; FOUR-HETEROJUNCTION DIODE; MONORAIL DOUBLE-HETEROJUNCTION DIODE.

HIGH-LOSS FIBER

AN OPTICAL FIBER HAVING A HIGH ENERGY LOSS, DUE TO ALL CAUSES, PER UNIT LENGTH OF FIBER, USUALLY MEASURED IN DB/KM AT A SPECIFIED WAVELENGTH. NOTE: HIGH-LOSS IS USUALLY CONSIDERED TO BE ABOVE 100 DB/KM ATTENUATION IN AMPLITUDE OF A PROPAGATING WAVE, CAUSED PRIMARILY BY SCATTERING DUE TO METAL IONS AND BY ABSORPTION DUE TO WATER IN THE OH RADICAL FORM.

HIGHLY-REFLECTIVE COATING

A BROAD CLASS OF SINGLE OR MULTILAYER COATINGS THAT ARE APPLIED TO AN OPTICAL SURFACE FOR THE PURPOSE OF INCREASING ITS REFLECTANCE OVER A SPECIFIED RANGE OF WAVELENGTHS. SINGLE FILMS OF ALUMINUM OR SILVER ARE COMMON; BUT MULTILAYERS OF AT LEAST TWO DIELECTRICS ARE UTILIZED WHEN LOW ABSORPTION IS IMPERATIVE. OTHER PARAMETERS, SUCH AS ANGLE OF INCIDENCE, AND INTENSITY OF RADIATION ARE ALSO SIGNIFICANT.

HOMOJUNCTION

IN A LASER DIODE, A SINGLE JUNCTION, I.E. A SINGLE REGION OF SHIFT IN DOPING FROM POSITIVE TO NEGATIVE MAJORITY CARRIER REGIONS, OR VICE VERSA, AND A CHANGE IN REFRACTIVE INDEX, AT ONE BOUNDARY, HENCE ONE ENERGY LEVEL SHIFT, ONE BARRIER, AND ONE REFRACTIVE INDEX SHIFT.

HOUR

SEE: LUMEN-HOUR.

HOUSING

SEE: LASER PROTECTIVE HOUSING.

I

ICELAND SPAR

A TRANSPARENT VARIETY OF THE NATURAL UNIAXIAL CRYSTAL CALCITE THAT DISPLAYS VERY STRONG DOUBLE REFRACTION, CHEMICALLY BEING CALCIUM CARBONATE CRYSTALLIZED IN THE HEXAGONAL RHOMBOHEDRAL CRYSTALLOGRAPHIC SYSTEM. SYNONYM: CALSPAR.

IDEAL BLACKBODY

SEE: BLACKBODY

ILLUMINANCE

LUMINOUS FLUX INCIDENT PER UNIT AREA OF A SURFACE. NOTE: ILLUMINANCE IS EXPRESSED IN LUMENS PER SQUARE METER. SYNONYM: ILLUMINATION.

ILLUMINATION

SEE: ILLUMINANCE.

IMAGE

IN AN OPTICAL SYSTEM, A REPRESENTATION OF AN OBJECT PRODUCED BY MEANS OF LIGHT RAYS. NOTE: AN IMAGE-FORMING OPTICAL ELEMENT FORMS AN IMAGE BY COLLECTING A BUNDLE OF LIGHT RAYS DIVERGING FROM AN OBJECT POINT AND TRANSFORMING IT INTO A BUNDLE OF RAYS THAT CONVERGE TOWARD, OR DIVERGE FROM, ANOTHER POINT. IF THE RAYS CONVERGE TO A POINT A REAL IMAGE OF THE OBJECT POINT IS FORMED; IF THE RAYS DIVERGE WITHOUT INTERSECTING EACH OTHER THEY APPEAR TO PROCEED FROM A VIRTUAL IMAGE. SEE: DOUBLE IMAGE; ERECT IMAGE; GEOMETRIC IMAGE; GHOST IMAGE; REFLECTION IMAGE; REVERTED IMAGE; VIRTUAL IMAGE.

IMAGE ASPECT

THE SPATIAL ORIENTATION OF AN IMAGE, SUCH AS NORMAL, CANTED, INVERTED,

REVERTED, OR ROTATED.

IMAGE BRIGHTNESS

IN AN OPTICAL SYSTEM, THE APPARENT BRIGHTNESS OF AN IMAGE AS SEEN THROUGH THE OPTICAL SYSTEM. NOTE: THIS BRIGHTNESS DEPENDS ON THE BRIGHTNESS OF THE OBJECT, THE TRANSMISSION, MAGNIFICATION, DISTORTION, AND DIAMETER OF THE EXIT PUPIL OF THE INSTRUMENT.

IMAGE DISSECTOR

IN FIBER OPTIC SYSTEMS, A BUNDLE OF FIBERS, WITH A TIGHTLY PACKED END ON WHICH AN IMAGE MAY BE FOCUSSED, IN WHICH THE FIBERS MAY BE SEPARATED INTO GROUPS, EACH GROUP TRANSMITTING PART OF THE IMAGE, EACH PART REMAINING COHERENT.

IMAGE INTENSIFIER

A DEVICE, SUCH AS AN ELECTROOPTIC TUBE WITH A FIBER-OPTIC FACEPLATE, CAPABLE OF INCREASING THE LUMINANCE OF A LOW-INTENSITY IMAGE OR SOURCE.

IMAGE INVERTER

IN FIBER OPTIC SYSTEMS, AN IMAGE ROTATOR THAT ROTATES THE IMAGE 180 DEGREES.

IMAGE JUMP

THE APPARENT DISPLACEMENT OF AN OBJECT DUE TO A PRISMATIC CONDITION IN AN OPTICAL SYSTEM.

IMAGE PLANE

THE PLANE IN WHICH AN IMAGE LIES OR IS FORMED, PERPENDICULAR TO THE AXIS OF A LENS. A REAL IMAGE FORMED BY A CONVERGING LENS WOULD BE VISIBLE UPON A SCREEN PLACED IN THIS PLANE.

IMAGE QUALITY

THOSE PROPERTIES OF A LENS OR OPTICAL SYSTEM THAT AFFECT THE OPTICAL PERFORMANCE, SUCH AS RESOLVING POWER: ABERRATIONS, IMAGE DEFECTS, AND CONTRAST RENDITION. NOTE: ABERRATIONS CONTRIBUTE TO POOR IMAGE QUALITY. ERRORS OF CONSTRUCTION AND DEFECTS IN MATERIALS ADVERSELY AFFECT IMAGE QUALITY. CHARACTERISTIC EFFECTS OF ABERRATIONS ON IMAGE QUALITY MAKE IT POSSIBLE TO DISTINGUISH BETWEEN THEIR EFFECTS AND THOSE OF ACCIDENTAL ERRORS OF WORKMANSHIP, SUCH AS NONSPHERICAL SURFACES, POOR POLISH, SCRATCHES, PITS, DECENTERING, DEFECTS IN CEMENTING, AND SCATTERED LIGHT, ALL OF WHICH CONTRIBUTE TO DETERIORATION OF THE IMAGE. DEFECTS IN GLASS SUCH AS BUBBLES, STONES, STRIAE, CRYSTALLINE BODIES, CLOUDINESS, STRAIN, SEEDS, CHICKEN-WIRE, AND OPAQUE MINERALS PLAY A PART IN POOR IMAGE QUALITY.

IMAGE ROTATOR

IN A FIBER OPTIC SYSTEM, A COHERENT BUNDLE OF FIBERS, THE OUTPUT END OF WHICH CAN BE ROTATED WITH RESPECT TO THE INPUT END, THUS TWISTING THE BUNDLE ALONG ITS LENGTH AND ROTATING THE OUTPUT IMAGE.

IMPURITY ABSORPTION

IN LIGHTWAVE TRANSMISSION MEDIA, SUCH AS OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS MADE OF GLASS, SILICA, PLASTIC, AND OTHER MATERIALS, THE ABSORPTION OF LIGHT ENERGY FROM A TRAVELLING OR STANDING WAVE BY FOREIGN ELEMENTS IN THE MEDIUM, SUCH AS IRON, COPPER, VANADIUM, CHROMIUM, HYDROXIDE, AND CHLORIDE IONS. NOTE: IF THE FE, CU, V, AND CR CONCENTRATIONS CAN BE HELD BELOW 8, 9, 18, AND 28 PARTS PER BILLION RESPECTIVELY, LESS THAN 20 DB/KILOMETER LOSSES CAN BE OBTAINED AT BAND CENTER. POWER ABSORPTION OCCURS PREDOMINANTLY FROM FOREIGN SUBSTANCES, SUCH AS TRANSITION METAL IONS LIKE IRON, COBALT, AND CHROMIUM. SLAB DIELECTRIC WAVEGUIDES ARE INCLUDED.

IMPURITY LEVEL

AN ELECTRON ENERGY LEVEL OF A MATERIAL OUTSIDE THE NORMAL ENERGY LEVELS OF THE MATERIAL, CAUSED BY THE PRESENCE OF IMPURITY ATOMS IN THE MATERIAL. NOTE: SUCH LEVELS ARE CAPABLE OF MAKING AN INSULATOR SEMI-CONDUCTING. THE IMPURITY ATOM MAY BE A DONOR OR AN ACCEPTOR; IF A DONOR, THE IMPURITY INDUCES ELECTRONIC CONDUCTION THROUGH THE TRANSFER OF AN ELECTRON TO THE CONDUCTION BAND. IF AN ACCEPTOR, THE IMPURITY CAN INDUCE HOLE CONDUCTION THROUGH THE ACCEPTANCE OF AN ELECTRON FROM THE VALENCE BAND.

INCANDESCENCE

THE EMISSION OF LIGHT BY THERMAL EXCITATION THAT BRINGS ABOUT ENERGY LEVEL TRANSITIONS THAT PRODUCE QUANTITIES OF PHOTONS SUFFICIENT TO RENDER THE SOURCE OF RADIATION VISIBLE.

INCIDENCE

THE ACT OF FALLING UPON OR AFFECTING, AS A RAY OF LIGHT UPON A SURFACE. NOTE: THE RAY IS IN THE DIRECTION OF PROPAGATION AND PERPENDICULAR TO THE WAVEFRONT, WHICH CONTAINS THE ELECTRIC AND MAGNETIC VECTORS OF A TRANSVERSE ELECTROMAGNETIC WAVE. SEE: GRAZING INCIDENCE; NORMAL INCIDENCE.

INCIDENCE ANGLE

IN OPTICS, THE ANGLE BETWEEN THE NORMAL TO A REFLECTING OR REFRACTING SURFACE AND THE INCIDENT RAY.

INCIDENT RAY

A RAY OF LIGHT THAT FALLS UPON, OR STRIKES, THE SURFACE OF ANY OBJECT SUCH AS A LENS, MIRROR, PRISM, THIS PRINTED PAGE, THE THINGS WE SEE, OR THE HUMAN EYE. NOTE: IT IS SAID TO BE INCIDENT TO THE SURFACE.

INCLUSION

A TERM USED TO DENOTE THE PRESENCE, WITHIN A MEDIUM, SUCH AS GLASS, OF EXTRANEOUS OR FOREIGN MATERIAL SUCH AS BUBBLES, SEEDS, AND STRIAE.

INDEX

SEE: ABSOLUTE REFRACTIVE INDEX.

INDEX FIBER

SEE: GRADED-INDEX FIBER; STEP-INDEX FIBER.

INDEX-MATCHING MATERIALS
LIGHT-CONDUCTING MATERIALS USED IN INTIMATE CONTACT TO REDUCE OPTICAL POWER LOSSES BY USING MATERIALS WITH REFRACTIVE INDICES AT INTERFACES THAT WILL REDUCE REFLECTION, INCREASE TRANSMISSION, AVOID SCATTERING AND REDUCE DISPERSION.

INDEX-OF-REFRACTION
SEE: REFRACTIVE INDEX.

INDEX PROFILE
SEE: GRADED-INDEX PROFILE; PARABOLIC-INDEX PROFILE; STEP-INDEX PROFILE; UNIFORM INDEX PROFILE.

INDIVIDUAL NORMAL MAGNIFICATION
THE APPARENT MAGNIFICATION PRODUCED BY A MAGNIFIER, SUCH AS A LENS OR A MIRROR, WHEN A PERSON HAS MYOPIA OR HYPEROPIA (HYPERMETROPIA). NOTE: THE INDIVIDUAL NORMAL MAGNIFICATION MAY BE DIFFERENT FROM THE ABSOLUTE MAGNIFIC-ATION.

INDUCED OPTICAL CONDUCTOR LOSS
SEE: CONNECTOR-INDUCED OPTICAL CONDUCTOR LOSS.

INFRARED
SEE: FAR INFRARED; MIDDLE INFRARED; NEAR INFRARED.

INFRARED BAND
THE BAND OF ELECTROMAGNETIC WAVELENGTHS BETWEEN THE EXTREME OF THE VISIBLE PART OF THE SPECTRUM, ABOUT 0.75 MICRONS AND THE SHORTEST MICRO-WAVES, ABOUT 1000 MICRONS. NOTE: THE IR REGION IS SOMETIMES SUBDIVIDED INTO NEAR INFRARED, 0.75-3 MICRONS; MIDDLE INFRARED, 3-30 MICRONS; AND FOR INFRARED, 30 - 1000 MICRONS.

INJECTION LASER
SEE: SEMICONDUCTOR LASER.

INJECTION LASER DIODE
A DIODE OPERATING AS A LASER PRODUCING A MONOCHROMATIC LIGHT MODULATED BY INJECTION OF CARRIERS ACROSS A P-N JUNCTION OF A SEMICONDUCTOR WITH NARROWER SPATIAL AND WAVELENGTH EMISSION CHARACTERISTICS FOR LONGER-RANGE HIGHER-DATA-RATE SYSTEMS THAN THE LEDS THAT ARE MORE APPLICABLE TO LARGER DIAMETER AND LARGER NUMERICAL APERTURE FIBERS FOR LOWER INFORMATION BANDWIDTHS.

INSERTION LOSS
IN LIGHTWAVE TRANSMISSION SYSTEMS, THE POWER LOST AT THE ENTRANCE TO A WAVEGUIDE, SUCH AS AN OPTICAL FIBER OR AN INTEGRATED OPTICAL CIRCUIT, DUE TO ANY AND ALL CAUSES SUCH AS FRESNEL REFLECTION, PACKING FRACTION, LIMITED NUMERICAL APERTURE, AXIAL MISALIGNMENT, LATERAL DISPLACEMENT, INITIAL

SCATTERING, OR REFLECTION.
SEE: CONNECTOR INSERTION LOSS.

INSIDE VAPOR-PHASE OXIDATION PROCESS (IVPO)

A CVPO PROCESS, FOR PRODUCTION OF OPTICAL FIBERS, IN WHICH DOPANTS, SUCH AS SILICON TETRACHLORIDE, ARE BURNED WITH DRY OXYGEN AND A FUEL GAS TO FORM AN OXIDE (SOOT) STREAM WHICH IS DEPOSITED ON THE INSIDE OF A ROTATING GLASS TUBE, THEN SINTERED TO PRODUCE A DOPED LAYER OF HIGHER REFRACTIVE INDEX GLASS ON THE INSIDE, THE TUBE THEN BEING DRAWN INTO A SOLID FIBER. SEE ALSO: OUTSIDE VAPOR PHASE OXIDATION PROCESS; CHEMICAL VAPOR PHASE OXIDATION PROCESS; MODIFIED INSIDE VAPOR-PHASE OXIDATION PROCESS.

INTEGRATED OPTICAL CIRCUIT (IOC)

A CIRCUIT, OR GROUP OF INTERCONNECTED CIRCUITS, CONSISTING OF MINIATURE SOLID STATE OPTICAL COMPONENTS, SUCH AS LIGHT-EMITTING DIODES, OPTICAL FILTERS, PHOTO DETECTORS (ACTIVE AND PASSIVE) AND THIN FILM OPTICAL WAVEGUIDES ON SEMICONDUCTOR OR DIELECTRIC SUBSTRATES. SYNONYM: OPTICAL INTEGRATED CIRCUIT.

INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR

TWO OR MORE OPTICAL WAVEGUIDES FABRICATED ON A MINUTE PIECE OF MATERIAL, SUCH AS LITHIUM NIOBATE, WHOSE LIGHT-PROPAGATING CHARACTERISTICS AND ENERGY INTERACTION CAN BE VARIED, SUCH AS BY APPLYING A VOLTAGE ACROSS A COMMON SECTION OF THE WAVEGUIDES, SO AS TO PERFORM THE FOUR MAJOR FUNCTIONS FOUND IN A RADIO RECEIVER, NAMELY FILTERING, COUPLING, SWITCHING, AND MODULATING. NOTE: SPECIAL ELECTRODES CONTROL THE PERFORMANCE OF THE VARIOUS FUNCTIONS.

INTEGRATED OPTICS

THE INTERCONNECTION OF MINIATURE OPTICAL COMPONENTS VIA OPTICAL WAVEGUIDES ON TRANSPARENT DIELECTRIC SUBSTRATES, USING OPTICAL SOURCES, MODULATORS, DETECTORS, FILTERS, COUPLERS, AND OTHER ELEMENTS INCORPORATED INTO CIRCUITS ANALAGOUS TO INTEGRATED ELECTRONIC CIRCUITS FOR THE EXECUTION OF VARIOUS COMMUNICATION, SWITCHING, AND LOGIC FUNCTIONS.

INTENSIFIER
SEE: IMAGE INTENSIFIER.

INTENSITY
SEE: PEAK RADIANT INTENSITY; LUMINOUS INTENSITY; RADIANT INTENSITY.
SEE: MEAN SPHERICAL INTENSITY.

INTENSITY MODULATION
SEE: ANALOG-INTENSITY MODULATION.

INTERFERENCE

IN LIGHT WAVE TRANSMISSION, THE SYSTEMATIC REINFORCEMENT AND ATTENUATION OF TWO OR MORE LIGHT WAVES WHEN THEY ARE SUPERIMPOSED. NOTE: INTERFERENCE IS AN ADDITIVE PROCESS. (THE TERM IS APPLIED ALSO TO THE CONVERSE PROCESS IN WHICH A GIVEN WAVE IS SPLIT INTO TWO OR MORE WAVES

BY, FOR EXAMPLE, REFLECTION AND REFRACTION AT BEAM-SPLITTERS.) THE SUPERPOSITION MUST OCCUR ON A SYSTEMATIC BASIS BETWEEN TWO OR MORE WAVES IN ORDER THAT THE ELECTRIC AND MAGNETIC FIELDS OF THE WAVES CAN BE ADDITIVE AND PRODUCE NOTICEABLE EFFECTS SUCH AS *INTERFERENCE PATTERNS*. FOR EXAMPLE THE PLANES OF POLARIZATIONS SHOULD NEARLY OR ACTUALLY COINCIDE OR THE WAVELENGTHS SHOULD NEARLY OR ACTUALLY BE THE SAME. SEE ALSO: FABRY-PEROT INTERFEROMETER.

INTERFEROMETER

AN INSTRUMENT EMPLOYING THE INTERFERENCE OF LIGHT WAVES FOR PURPOSES OF MEASUREMENT, SUCH AS THE ACCURACY OF OPTICAL SURFACES BY MEANS OF NEWTON'S RINGS, THE MEASUREMENT OF OPTICAL PATHS, AND LINEAR AND ANGULAR DISPLACEMENTS. SEE: FABRY-PEROT INTERFEROMETER; TWYMAN-GREEN *INTERFEROMETER*.

INTERNAL ABSORPTANCE

THE RATIO OF LIGHT FLUX ABSORBED BETWEEN THE ENTRANCE AND EMERGENT SURFACES OF A MEDIUM, TO THE FLUX THAT HAS PENETRATED THE ENTRANCE SURFACE. NOTE: THE EFFECTS OF INTERREFLECTIONS BETWEEN THE TWO SURFACES ARE NOT INCLUDED. INTERNAL ABSORPTANCE IS NUMERICALLY EQUAL TO UNITY MINUS THE INTERNAL TRANSMITTANCE.

INTERNAL OPTICAL DENSITY

THE LOGARITHM TO THE BASE TEN OF THE RECIPROCAL OF THE INTERNAL TRANSMITTANCE. SYNONYM: TRANSMISSION FACTOR.

INTERNAL PHOTOEFFECT

THE CHANGES *IN CHARACTERISTICS OF A MATERIAL THAT OCCUR*, SUCH AS CONDUCTIVITY, EMISSIVITY, OR ELECTRIC POTENTIAL DEVELOPED, WHEN INCIDENT PHOTONS ARE ABSORBED BY THE MATERIAL AND EXCITE THE ELECTRONS IN THE VARIOUS ENERGY BANDS, FOR EXAMPLE ELECTRONS MAY MOVE FROM A VALENCE BAND TO A CONDUCTION BAND FOR BOTH INTRINSIC MATERIAL AND IMPURITIES; OR TO OR FROM THE VALENCE BANDS OF THE INTRINSIC MATERIAL AND IMPURITIES; I.E. DOPANTS AND OTHER IMPURITIES; THUS BOTH INTRINSIC AND EXTRINSIC PHOTOEFFECTS MAY BE INVOLVED IN THE INTERNAL PHOTOEFFECT. SEE: EXTRINSIC INTERNAL PHOTOEFFECT; INTRINSIC INTERNAL PHOTOEFFECT.

INTERNAL PHOTOEFFECT DETECTOR

A PHOTODETECTOR IN WHICH INCIDENT PHOTONS RAISE ELECTRONS FROM A LOWER TO A HIGHER ENERGY STATE, RESULTING IN AN ALTERED STATE OF THE ELECTRONS, HOLES, OR ELECTRON-HOLE PAIRS GENERATED BY THE TRANSITION, WHICH IS THEN DETECTED. NOTE: MOST SEMICONDUCTORS MAKE USE OF THE INTERNAL PHOTOEFFECT FOR SIGNAL DETECTION AT THE END OF AN OPTICAL FIBER. SEE ALSO: EXTERNAL PHOTOEFFECT DETECTOR

INTERNAL REFLECTION

SEE: TOTAL INTERNAL REFLECTION.

INTERNAL REFLECTION ANGLE

SEE: CRITICAL ANGLE.

INTERNAL TRANSMITTANCE

THE RATIO OF THE FLUX TRANSMITTED TO THE SECOND SURFACE OF A MEDIUM TO THE CORRESPONDING FLUX THAT HAS JUST PASSED THROUGH THE FIRST SURFACE. I.E. THE TRANSMITTANCE FROM THE FIRST SURFACE TO THE SECOND SURFACE. NOTE: INTERNAL TRANSMITTANCE DOES NOT INCLUDE THE EFFECTS DUE TO INTERREFLECTION BETWEEN THE TWO SURFACES.

INTRINSIC ABSORPTION

IN LIGHTWAVE TRANSMISSION MEDIA. SUCH AS OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS MADE OF GLASS. SILICA. PLASTIC. AND OTHER MATERIALS. THE ABSORPTION OF LIGHT ENERGY FROM A TRAVELLING OR STANDING WAVE BY THE MEDIUM ITSELF. CAUSING ATTENUATION AS A FUNCTION OF DISTANCE. MATERIAL PROPERTIES. MODE. FREQUENCY. AND OTHER FACTORS. NOTE: INTRINSIC ABSORPTION IS PRIMARILY DUE TO CHARGE TRANSFER BANDS IN THE ULTRAVIOLET REGION AND VIBRATION OR MULTIPHONON BANDS IN THE NEAR INFRARED. PARTICULARLY IF THEY EXTEND INTO THE REGION OF WAVELENGTHS USED IN FIBER COMMUNICATIONS. NAMELY 700-1100 NANOMETERS.

INTRINSIC INTERNAL PHOTOEFFECT

AN INTERNAL PHOTOEFFECT INVOLVING THE BASIC MATERIAL RATHER THAN ANY DOPANTS OR OTHER IMPURITIES. SEE ALSO: EXTRINSIC INTERNAL PHOTOEFFECT.

INTRINSIC-NEGATIVE PHOTODIODE COUPLER

SEE: POSITIVE-INTRINSIC-NEGATIVE PHOTODIODE COUPLER.

INVERSION

SEE: POPULATION INVERSION.

INVERTER

SEE: IMAGE INVERTER.

ICC

SEE: INTEGRATED OPTICAL CIRCUIT.

ION-EXCHANGE PROCESS

SEE: DOUBLE-CRUCIBLE PROCESS (DC).

ION LASER

A GAS LASER INVOLVING IONIZATION OF CERTAIN GASES. SUCH AS ARGON. KYPTON. AND XENON.

IRRADIANCE

THE POWER PER UNIT AREA OF INCIDENT LIGHT UPON A SURFACE. NOTE: THE RADIANT FLUX INCIDENT UPON A UNIT AREA OF SURFACE. IT CAN BE MEASURED AS WATTS PER SQUARE METER. AS FOR ANY FORM OF ELECTROMAGNETIC WAVES. OR AS LUMENS PER SQUARE METER WHEN VISIBLE LIGHT IS INCIDENT UPON A SURFACE. THE OLD UNIT WAS FOOT-CANDLES. SYNONYM: RADIANT FLUX

DENSITY. SEE: SPECTRAL IRRADIANCE.

IRRADIATION
THE PRODUCT OF IRRADIANCE AND TIME, THEREFORE RADIANT ENERGY RECEIVED PER UNIT AREA.

ISOTROPIC MATERIAL
A SUBSTANCE THAT EXHIBITS THE SAME PROPERTY WHEN TESTED ALONG AN AXIS IN ANY DIRECTION, FOR EXAMPLE, A DIELECTRIC MATERIAL WITH THE SAME PERMITTIVITY OR A GLASS WITH THE SAME INDEX OF REFRACTION IN ALL DIRECTIONS.

IVPO
SEE: INSIDE VAPOR-PHASE OXIDATION PROCESS.

J

JACKET
SEE: BUNDLE JACKET; CABLE JACKET; OPTICAL FIBER JACKET.

JUMP
SEE: IMAGE JUMP.

JUNCTION
SEE: DOUBLE HETEROJUNCTION; HETEROJUNCTION; SINGLE HETEROJUNCTION. OPTICAL FIBER JUNCTION.

JUNCTION DIODE
SEE: DOUBLE HETEROJUNCTION DIODE; FIVE-LAYER FOUR-HETEROJUNCTION DIODE; FOUR-HETEROJUNCTION DIODE; MONORAIL DOUBLE-HETEROJUNCTION DIODE.

K

SEE: BOLTZMANN'S CONSTANT.

KERR CELL

A SUBSTANCE, USUALLY A LIQUID, WHOSE REFRACTIVE INDEX CHANGE IS PROPORTIONAL TO THE SQUARE OF THE APPLIED ELECTRIC FIELD, THE SUBSTANCE BEING CONFIGURED SO AS TO BE PART OF ANOTHER SYSTEM, SUCH AS AN OPTICAL PATH, THE CELL THUS PROVIDING A MEANS OF MODULATING THE LIGHT IN THE OPTICAL PATH.

KNIFE-EDGE TEST

SEE: FOUCAULT KNIFE-EDGE TEST.

L

LAMBERT

A UNIT OF LUMINANCE, EQUAL TO 10 (4 POWER)/PI CANDLES PER SQUARE METER. NOTE: THE SI UNIT OF LUMINANCE IS THE LUMEN PER SQUARE METER, WHEREIN 4 TIMES PI LUMENS OF LIGHT FLUX EMANATE FROM ONE CANDELA.

LAMBERTIAN

PERTAINING TO A RADIANCE DISTRIBUTION THAT IS UNIFORM IN ALL DIRECTIONS. SEE: UNIFORM LAMBERTIAN.

LAMBERTIAN SOURCE

AN EMITTER THAT RADIATES ELECTROMAGNETIC WAVES ACCORDING TO THE COSINE EMISSION LAW.

LAMBERT'S EMISSION LAW

SEE: COSINE EMISSION LAW.

LAMBERT'S LAW

IN THE TRANSMISSION OF ELECTROMAGNETIC RADIATION THROUGH A SCATTERING OR ABSORPTIVE MEDIUM, THE INTERNAL TRANSMITTANCE OF A GIVEN THICKNESS D(2) IS RELATED TO THE KNOWN TRANSMITTANCE, T(1), OF A KNOWN THICKNESS, D(1), BY THE RELATIONSHIP: T(2) = T(1) RAISED TO THE D(2)/D(1) POWER. SEE ALSO: BEER'S LAW; BOUGER'S LAW.

LARGE OPTICAL-CAVITY DIODE (LOC)

A LASER DIODE IN WHICH THE P-N JUNCTION IS PLACED BETWEEN TWO HETEROJUNCTIONS, THUS PROVIDING FOR A WIDE OPTICAL CAVITY FOR LASING ACTION, THE WIDER CAVITY HAVING A HIGHER REFRACTIVE INDEX THAN THE MATERIAL ON EITHER SIDE OF THE CAVITY RESULTING IN AN OUTPUT BEAM THAT IS WIDER WITH INCREASED POWER.

LASER

SEE: GAS LASER; GLASS LASER; LIQUID LASER; MIXED-GAS LASER; MOLECULAR LASER; MULTILINE LASER; Q-SWITCHED REPETITIVELY-PULSED LASER; MULTIMODE LASER; SEMICONDUCTOR LASER; SOLID-STATE LASER; TRANSVERSE-EXCITED ATMOSPHERE LASER; TUNABLE LASER.

LASER BASIC MODE

THE PRIMARY OR LOWEST ORDER FUNDAMENTAL TRANSVERSE PROPAGATION MODE FOR THE EMITTED LIGHT WAVE OF A LASER, THE EMITTED ENERGY NORMALLY HAVING GAUSSIAN (BELL-SHAPED) DISTRIBUTION IN SPACE AND ALL THE ENERGY IS IN A SINGLE BEAM, WITH NO SIDE LOBES.

LASER DIODE (LD)

A JUNCTION DIODE, CONSISTING OF POSITIVE AND NEGATIVE CARRIER REGIONS WITH A P-N TRANSITION REGION (JUNCTION), THAT EMITS ELECTROMAGNETIC RADIATION (QUANTA OF ENERGY) AT OPTICAL FREQUENCIES WHEN INJECTED ELECTRONS UNDER FORWARD BIAS RECOMBINE WITH HOLES IN THE VICINITY OF THE JUNCTION. NOTE: IN CERTAIN MATERIALS, SUCH AS GALLIUM ARSENIDE, THERE IS A HIGH PROBABILITY OF RADIATIVE RECOMBINATION PRODUCING EMITTED LIGHT, RATHER THAN HEAT, AT A FREQUENCY SUITABLE FOR OPTICAL WAVEGUIDES. SOME LIGHT IS REFLECTED BY THE POLISHED ENDS AND IS TRAPPED TO STIMULATE MORE EMISSION, WHICH FURTHER EXCITES, OVERCOMING LOSSES, TO PRODUCE LASER ACTION. SEE: INJECTION LASER DIODE.

LASER DIODE COUPLER

A COUPLING DEVICE THAT ENABLES THE COUPLING OF LIGHT ENERGY FROM A LASER DIODE (LD) SOURCE TO AN OPTICAL FIBER OR CABLE AT THE TRANSMITTING END OF AN OPTICAL FIBER DATA LINK. NOTE: THE COUPLER MAY BE AN OPTICAL FIBER PIGTAIL EPOXIED TO THE LD. SYNONYM: LD COUPLER.

LASER FIBER OPTIC TRANSMISSION SYSTEM

A SYSTEM CONSISTING OF ONE OR MORE LASER TRANSMITTERS AND ASSOCIATED FIBER OPTIC CABLES. NOTE: DURING NORMAL OPERATION, THE LASER RADIATION IS LIMITED TO THE CABLE. THUS, LASER SYSTEMS THAT EMPLOY FIBER OPTIC TRANSMISSON SHALL HAVE CABLE SERVICE CONNECTION THAT REQUIRES A TOOL TO DISCONNECT IF SUCH CABLE CONNECTIONS FORM PART OF THE PROTECTIVE HOUSING. CONSIDERATION SHOULD ALSO BE GIVEN TO INCORPORATING MECHANICAL BEAM ATTENUATORS AT CONNECTORS. SAFETY ASPECTS PECULIAR TO FIBER OPTICS ARE AN IMPORTANT CONSIDERATION.

LASER HEAD

A MODULE CONTAINING THE ACTIVE LASER MEDIUM, RESONANT CAVITY, AND OTHER COMPONENTS WITHIN ONE ENCLOSURE, NOT NECESSARILY INCLUDING A POWER SUPPLY.

LASER LINEWIDTH

IN THE OPERATION OF A LASER, THE FREQUENCY RANGE OVER WHICH MOST OF THE LASER BEAM'S ENERGY IS DISTRIBUTED.

LASER MEDIUM

SEE: ACTIVE LASER MEDIUM.

LASER PROTECTIVE HOUSING

A PROTECTIVE HOUSING FOR A LASER TO PREVENT HUMAN EXPOSURE TO LASER RADIATION IN EXCESS OF AN ALLOWABLE ESTABLISHED, OR STATUTORY EMISSION LIMIT FOR THE APPROPRIATE CLASS. NOTE: PARTS OF THE HOUSING THAT CAN BE REMOVED OR DISPLAYED AND NOT INTERLOCKED MAY BE SECURED IN SUCH A WAY THAT REMOVAL OR DISPLACEMENT OF THE PARTS REQUIRES THE USE OF SPECIAL TOOLS.

LASER PULSE LENGTH

THE TIME DURATION OF THE BURST OF ELECTROMAGNETIC ENERGY EMITTED BY A PULSED LASER. NOTE: IT IS USUALLY MEASURED AT THE HALF-POWER POINTS, I.E., ON A PLOT OF PULSE POWER DEVELOPED VERSUS TIME, THE TIME INTERVAL BETWEEN THE POINTS THAT ARE AT 0.5 OF THE PEAK OF THE POWER CURVE. SYNONYM: LASER PULSE WIDTH.

LASER PULSE WIDTH

SEE: LASER PULSE LENGTH.

LASER SERVICE CONNECTION

AN ACCESS POINT IN A LASER-TO-FIBER-OPTIC TRANSMISSION SYSTEM THAT IS DESIGNED FOR SERVICE AND THAT, FOR SAFETY, SHOULD REQUIRE A TOOL TO DISCONNECT.

LASING

THE PHENOMENON THAT OCCURS WHEN RESONANT FREQUENCY-CONTROLLED ENERGY IS COUPLED TO A SPECIALLY PREPARED MATERIAL, SUCH AS A UNIFORMLY-DOPED SEMICONDUCTOR CRYSTAL THAT HAS FREE-MOVING OR HIGHLY MOBILE LOOSELY-COUPLED ELECTRONS AND, AS A RESULT OF RESONANCE AND THE IMPARTING OF ENERGY BY COLLISION OR CLOSE APPROACH, RAISES ELECTRONS TO HIGHLY EXCITED ENERGY STATES, WHICH WHEN THEY MOVE TO LOWER STATES, CAUSES QUANTA OF HIGH-EMERGY ELECTROMAGNETIC RADIATION TO BE RELEASED AS COHERENT LIGHT WAVES. NOTE: THIS ACTION TAKES PLACE IN A LASER.

LASING MEDIUM

SEE: ACTIVE LASER MEDIUM.

LATERAL DISPLACEMENT LOSS

IN AN IN-LINE (BUTT) SPLICE OF AN OPTICAL FIBER, THE LOSS OF SIGNAL POWER CAUSED BY A SIDE-WISE DISPLACEMENT OF THE OPTICAL AXES OF THE TWO FIBER ENDS THAT ARE JOINED.

LATERAL MAGNIFICATION

THE RATIO OF THE LINEAR SIZE OF AN IMAGE TO THAT OF THE OBJECT, AS WHEN AN ENLARGING LENS IS USED.

LAUNCH ANGLE

IN AN OPTICAL FIBER OR FIBER BUNDLE, THE ANGLE BETWEEN THE INPUT RADIATION VECTOR, I.E., THE INPUT LIGHT CHIEF RAY, AND THE AXIS OF THE FIBER OR FIBER BUNDLE. NOTE: IF THE ENDS OF THE FIBERS ARE PERPENDICULAR TO THE AXIS OF THE FIBERS, THE LAUNCH ANGLE IS EQUAL TO THE ANGLE OF INCIDENCE WHEN

THE RAY IS EXTERNAL AND THE ANGLE OF REFRACTION WHEN INITIALLY INSIDE THE FIBER.

LAW
SEE: BEER'S LAW; BOUGER'S LAW; BREWSTER'S LAW; COSINE-EMISSION LAW; LAMBERT'S LAW; PLANCK'S LAW; REFLECTION LAW; RICHARDSON'S LAW; SNELL'S LAW.

LD
SEE: LASER DIODE.

LD COUPLER
SEE: LASER DIODE COUPLER.

LEAKAGE LOSS
SEE: LIGHT-LEAKAGE LOSS.

LEA LASER
SEE: LONGITUDINALLY-EXCITED ATMOSPHERE LASER.

LEAST-TIME PRINCIPLE
SEE: FERMAT PRINCIPLE.

LED
SEE: EDGE-EMITTING LED.
SEE: LIGHT-EMITTING DIODE.

LED COUPLER
SEE: LIGHT-EMITTING DIODE COUPLER.

LENGTH
SEE: BACK FOCAL LENGTH; EQUIVALENT FOCAL LENGTH; FRONT FOCAL LENGTH.
SEE: FOCAL LENGTH; LASER PULSE LENGTH; OPTICAL PATH LENGTH; PULSE LENGTH.

LENS
AN OPTICAL COMPONENT MADE OF ONE OR MORE PIECES OF A MATERIAL TRANSPARENT TO THE RADIATION PASSING THROUGH, HAVING CURVED SURFACES, THAT IS CAPABLE OF FORMING AN IMAGE, EITHER REAL OR VIRTUAL, OF THE OBJECT SOURCE OF THE RADIATION, AT LEAST ONE OF THE CURVED SURFACES BEING CONVEX OR CONCAVE, NORMALLY SPHERICAL BUT SOMETIMES ASPHERIC. SEE: COLLECTIVE LENS; COMPOUND LENS; CONVERGING LENS; DIVERGING LENS.

A TRANSPARENT OPTICAL ELEMENT, USUALLY MADE FROM OPTICAL GLASS, HAVING TWO OPPOSITE POLISHED MAJOR SURFACES OF WHICH AT LEAST ONE IS CONVEX OR CONCAVE IN SHAPE AND USUALLY SPHERICAL. NOTE: THE POLISHED MAJOR SURFACES ARE SHAPED SO THAT THEY SERVE TO CHANGE THE AMOUNT OF CONVERGENCE OR DIVERGENCE OF THE TRANSMITTED RAYS. SEE: ACHROMATIC LENS; APLANATIC LENS; BITORIC LENS; CARTESIAN LENS; CONCENTRIC LENS; CONDENSING; CORRECTED LENS; CYLINDRICAL LENS; DIVERGENT MENISCUS LENS; FIELD LENDS; FINISHED LENS; PLANO

LENS; PLANOCONCAVE LENS; PLANOCONVEX LENS; TAPERED LENS; TELEPHOTO LENS; THICK LENS; THIN LENS; ZOOM LENS.

LENS COUPLING

IN OPTICAL WAVEGUIDES, SUCH AS OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS, THE TRANSFER OF ELECTROMAGNETIC ENERGY FROM SOURCE TO GUIDE, OR FROM GUIDE TO GUIDE, BY MEANS OF A LENS PLACED BETWEEN THE SOURCE AND SINK. NOTE: COUPLING LOSS CAN BE REDUCED TO PACKING FRACTION LOSS, AXIAL MISALIGNMENT LOSS AND AXIAL DISPLACEMENT LOSS WHEN A LENS IS USED. SEE ALSO: DIRECT COUPLING.

LENS MEASURE

A MECHANICAL DEVICE FOR MEASURING SURFACE CURVATURE IN TERMS OF DIOPTRIC POWER.

LENS SPEED

THAT PROPERTY OF A LENS THAT AFFECTS THE ILLUMINANCE OF THE IMAGE IT PRODUCES. NOTE: LENS SPEED MAY BE SPECIFIED IN TERMS OF THE APERTURE RATIO, NUMERICAL APERTURE, T-STOP, OR F-NUMBER.

LENS SYSTEM

TWO OR MORE LENSES ARRANGED TO WORK IN CONJUNCTION WITH ONE ANOTHER.

LENS WATCH

A DIAL DEPTH GAGE GRADUATED IN DIOPTERS.

LEVEL

SEE: ENERGY LEVEL; IMPURITY LEVEL.

LEVER

SEE: OPTICAL LEVER.

LIGHT

1. ELECTROMAGNETIC WAVES OF RADIANT ENERGY OF WAVELENGTHS FROM ABOUT 0.3 MICRONS TO 30 MICRONS; THUS INCLUDING THE VISIBLE WAVELENGTHS FROM 0.38 MICRONS TO 0.78 MICRONS AND THOSE WAVELENGTHS, SUCH AS ULTRAVIOLET AND INFRARED, THAT CAN BE HANDLED BY THE OPTICAL TECHNIQUES USED FOR THE VISIBLE REGION. RADIANT ELECTROMAGNETIC ENERGY WITHIN THE LIMITS OF HUMAN VISIBILITY AND THEREFORE WITH WAVELENGTHS TO WHICH THE HUMAN RETINA IS RESPONSIVE, APPROXIMATELY 0.38 MICRONS TO 0.78 MICRONS. SEE: COHERENT LIGHT; COLLIMATED LIGHT; MONOCHROMATIC LIGHT; POLARIZED LIGHT; SPACE-COHERENT LIGHT; TIME-COHERENT LIGHT; ULTRAVIOLET LIGHT; VELOCITY OF LIGHT; WHITE LIGHT. SEE ALSO: LIGHTWAVE COMMUNICATIONS; WAVELENGTH.

LIGHT ABSORPTION

THE CONVERSION OF LIGHT INTO OTHER FORMS OF ENERGY UPON TRAVERSING A MEDIUM, THUS WEAKENING THE TRANSMITTED LIGHT BEAM. ENERGY REFLECTANCE R, TRANSMITTANCE T, ABSORPTION A, AND SCATTERING S, OBEY THE LAW OF THE CONSERVATION OF ENERGY, $R+T+A+S = 1$.

LIGHT ADAPTATION

THE ABILITY OF THE HUMAN EYE TO ADJUST ITSELF TO A CHANGE IN THE INTENSITY OF LIGHT.

LIGHT ANALYZER

FOR INCIDENT LIGHT, A POLARIZING ELEMENT THAT CAN BE ROTATED ABOUT ITS AXIS TO CONTROL THE AMOUNT OF TRANSMISSION OF INCIDENT PLANE POLARIZED LIGHT, OR TO DETERMINE THE PLANE OF POLARIZATION OF THE INCIDENT LIGHT.

LIGHT ANTENNA

A SYSTEM OF REFLECTING AND REFRACTING OPTICAL COMPONENTS ARRANGED TO GUIDE OR DIRECT A BEAM OF LIGHT.

LIGHT CONDUIT

SEE: NON-COHERENT BUNDLE.

LIGHT-EMITTING DIODE (LED)

A DIODE THAT OPERATES SIMILAR TO A LASER DIODE, WITH THE SAME OUTPUT POWER LEVEL, THE SAME OUTPUT LIMITING MODULATION RATE, AND THE SAME OPERATIONAL CURRENT DENSITIES, I.E., THOUSANDS OF AMPERES PER SQUARE CENTIMETER WHICH CAUSES CATASTROPHIC AND GRACEFUL DEGRADATION, BUT WITH GREATER SIMPLICITY, TOLERANCE, AND RUGGEDNESS; AND ABOUT TEN TIMES THE SPECTRAL WIDTH OF ITS RADIATION.

LIGHT-EMITTING DIODE COUPLER

A COUPLING DEVICE THAT ENABLES THE COUPLING OF LIGHT ENERGY FROM A LIGHT-EMITTING DIODE (LED) SOURCE TO AN OPTICAL FIBER OR CABLE AT THE TRANSMITTING END OF AN OPTICAL FIBER DATA LINK. NOTE: THE COUPLER MAY BE AN OPTICAL FIBER PIGTAIL EPOXIED TO THE LED. SYNONYM: LED COUPLER.

LIGHT GUIDE

AN ASSEMBLY OF OPTICAL FIBERS AND OTHER OPTICAL ELEMENTS MOUNTED AND FINISHED IN A COMPONENT THAT IS USED TO TRANSMIT LIGHT.

SEE: ULTRAVIOLET LIGHT GUIDE.

LIGHT-LEAKAGE LOSS

LIGHT ENERGY LOSS IN A LIGHT TRANSMISSION SYSTEM, SUCH AS IN A LIGHT CONDUIT, OPTICAL FIBER CABLE, CONNECTOR, OR OPTICAL INTEGRATED CIRCUIT, DUE TO ANY MEANS OF ESCAPE, SUCH AS IMPERFECTIONS AT CORE-CLADDING BOUNDARIES, BREAKS IN JACKETS, AND LESS-THAN-CRITICAL-RADIUS BENDING.

LIGHT PENCIL

IN OPTICS, A NARROW BUNDLE OF LIGHT RAYS, DIVERGING FROM A POINT SOURCE OR CONVERGING TOWARD AN IMAGE POINT.

LIGHT QUANTITY

THE PRODUCT OF LUMINOUS FLUX AND TIME.

LIGHT RAY

A LINE, PERPENDICULAR TO THE WAVE FRONT OF LIGHT WAVES, INDICATING THEIR DIRECTION OF TRAVEL AND REPRESENTING THE LIGHT WAVE ITSELF.

LIGHTWAVE COMMUNICATIONS

THAT ASPECT OF COMMUNICATIONS AND TELECOMMUNICATIONS DEVOTED TO THE DEVELOPMENT AND USE OF EQUIPMENT THAT USES ELECTROMAGNETIC WAVES IN OR NEAR THE VISIBLE REGION OF THE SPECTRUM FOR COMMUNICATION PURPOSES. NOTE: LIGHTWAVE COMMUNICATION EQUIPMENT INCLUDES SOURCES, MODULATORS, TRANSMISSION MEDIA, DETECTORS, CONVERTERS, INTEGRATED OPTIC CIRCUITS, AND RELATED DEVICES, USED FOR GENERATING AND PROCESSING LIGHT WAVES. THE TERM OPTICAL COMMUNICATIONS IS ORIENTED TOWARD THE NOTION OF OPTICAL EQUIPMENT WHEREAS THE TERM LIGHTWAVE COMMUNICATIONS IS ORIENTED TOWARD THE SIGNAL BEING PROCESSED. SYNONYM: OPTICAL COMMUNICATIONS. SEE ALSO: LIGHT.

LIMIT

SEE: ACCOMMODATION LIMIT.

LIMITED OPERATION

SEE: DETECTOR-NOISE-LIMITED OPERATION; DISPERSION-LIMITED OPERATION; QUANTUM-LIMITED OPERATION; THERMAL-NOISE-LIMITED OPERATION.

LIMITING RESOLUTION ANGLE

THE ANGLE SUBTENDED BY TWO POINTS OR LINES THAT ARE JUST FAR ENOUGH APART TO PERMIT THEM TO BE DISTINGUISHED AS SEPARATE. NOTE: THE ABILITY OF AN OPTICAL DEVICE TO RESOLVE TWO POINTS OR LINES IS CALLED RESOLVING POWER AND QUANTITATIVELY IS INVERSELY PROPORTIONAL TO THE LIMITING ANGLE OF RESOLUTION.

LINE

SEE: GOUBAU LINE.

LINK

SEE: OPTICAL DATA LINK.

LIQUID-CORE FIBER

AN OPTICAL FIBER CONSISTING OF OPTICAL GLASS, QUARTZ OR SILICA TUBING FILLED WITH A HIGHER REFRACTIVE INDEX LIQUID, SUCH AS TETRACHLOROETHYLENE THAT HAS ATTENUATION TROUGHS LESS THAN 8 DB/KM AT 1.090, 1.205, AND 1.280 MICRONS.

LIQUID LASER

A LASER WHOSE ACTIVE MEDIUM IS IN LIQUID FORM, SUCH AS ORGANIC DYE AND INORGANIC SOLUTIONS. NOTE: DYE LASERS ARE COMMERCIALLY AVAILABLE; THEY ARE OFTEN CALLED ORGANIC DYE OR TUNABLE DYE LASERS.

LOADED DIFFUSED OPTICAL WAVEGUIDE

SEE: STRIP-LOADED DIFFUSED OPTICAL WAVEGUIDE.

LOC

SEE: LARGE OPTICAL-CAVITY DIODE.

LONGITUDINALLY-EXCITED ATMOSPHERE LASER (LEA)

A GAS LASER IN WHICH THE ELECTRIC FIELD EXCITATION OF THE ACTIVE MEDIUM IS LONGITUDINAL TO (IN THE DIRECTION OF) THE FLOW OF THE ACTIVE MEDIUM. NOTE: THIS TYPE OF LASER OPERATES IN A GAS PRESSURE RANGE LOWER THAN THAT REQUIRED FOR TRANSVERSE-EXCITATION.

LOOSE-TUBE SPLICER

A GLASS TUBE WITH A SQUARE HOLE USED TO SPLICE TWO OPTICAL FIBERS; THE CURVED FIBERS ARE MADE TO SEEK THE SAME CORNER OF THE SQUARE HOLE, THUS HOLDING THEM IN ALIGNMENT UNTIL THE INDEX-MATCHING EPOXY, ALREADY IN THE TUBE, CURES, THUS FORMING AN ALIGNED, LOW-LOSS BUTTED JOINT. SEE ALSO: PRECISION-SLEEVE SPLICER; TANGENTIAL COUPLING.

LOSS

SEE: ABSORPTION LOSS; ANGULAR MISALIGNMENT LOSS; CONNECTOR INDUCED OPTICAL CONDUCTOR LOSS; CONNECTOR INSERTION LOSS; COUPLING LOSS; FRESNEL REFLECTION LOSS; GAP LOSS; LATERAL DISPLACEMENT LOSS; LIGHT-LEAKAGE LOSS; MISALIGNMENT LOSS; MISMATCH-OF-CORE-RADII LOSS; MODAL LOSS; PACKING FRACTION LOSS; REFRACTIVE-INDEX-PROFILE MISMATCH LOSS; SCATTERING LOSS; SOURCE-TO-FIBER LOSS.

SEE: MICROBENDING LOSS; SOURCE-COUPLER LOSS.

LOSSY MEDIUM

A WAVE PROPAGATION MEDIUM IN WHICH A SIGNIFICANT AMOUNT OF THE ENERGY OF THE WAVE IS ABSORBED PER UNIT DISTANCE TRAVELLED BY THE WAVE. FOR EXAMPLE, IN AN OPTICAL FIBER CLADDING, LOSSY MATERIAL IS USED TO ATTENUATE BY ABSORPTION THE ENERGY THAT HAS LEAKED OUTSIDE THE FIBER CORE.

LOUPE

SEE: MAGNIFIER.

LOW-LOSS FEP-CLAD SILICA FIBER

AN OPTICAL FIBER CONSISTING OF A PURE FUSED SILICA CORE AND A PERFLUORONATED ETHYLENE-PROPYLENE (FEP) (A COMMERCIAL POLYMER) CLADDING. NOTE: FEP-CLAD SILICA FIBERS HAVE REFRACTIVE INDICES OF 1.458 AND 1.338 FOR THE CORE AND CLADDING RESPECTIVELY, AND A TRANSMISSION LOSS OF 2 TO 3 DB/KM AT THE PRESENT TIME, WITH AN ULTRAVIOLET CAPABILITY AT 0.546 MICRONS OF 360 DB/KM.

LOW-LOSS FIBER

AN OPTICAL FIBER HAVING A LOW ENERGY LOSS, DUE TO ALL CAUSES, PER UNIT LENGTH OF FIBER, USUALLY MEASURED IN DB/KM AT A SPECIFIED WAVELENGTH. NOTE: LOW-LOSS IS USUALLY CONSIDERED TO BE BELOW 20 DB/KM. ATTENUATION IN AMPLITUDE OF A PROPAGATING WAVE IS CAUSED PRIMARILY BY SCATTERING DUE TO METAL IONS AND BY ABSORPTION DUE TO WATER IN THE OH RADICAL FORM.

LUMEN

THE SI UNIT OF LIGHT FLUX CORRESPONDING TO 1/(4 PI) OF THE TOTAL LIGHT FLUX EMITTED BY A SOURCE HAVING AN INTENSITY OF 1 CANDELA, THUS BEING EQUAL TO THE FLUX ISSUING FROM ONE-SIXTIETH OF A SQUARE CENTIMETER OF OPENING OF THE STANDARD SOURCE, AND INCLUDED IN A SOLID ANGLE OF ONE STERADIAN.

LUMEN-HOUR

THE UNIT QUANTITY OF LIGHT EQUAL TO ONE LUMEN OF LUMINOUS FLUX FLOWING FOR ONE HOUR.

LUMEN-SECOND

THE UNIT QUANTITY OF LIGHT EQUAL TO ONE LUMEN OF LUMINOUS FLUX FLOWING FOR ONE SECOND.

LUMERG

THE CENTIMETER-GRAM-SECOND UNIT OF LUMINOUS ENERGY, EQUAL TO 10(-7) LUMEN-SECOND.

LUMINANCE

THE RATIO OF THE LUMINOUS INTENSITY EMITTED BY A LIGHT SOURCE IN A GIVEN DIRECTION BY AN INFINITESIMAL AREA OF THE SOURCE, TO THE PROJECTION OF THAT AREA OF THE SOURCE UPON THE PLANE PERPENDICULAR TO THE GIVEN DIRECTION. NOTE: LUMINANCE IS USUALLY STATED AS LUMINOUS INTENSITY PER UNIT AREA; I.E., LUMINOUS FLUX EMITTED PER UNIT SOLID ANGLE PROJECTED PER UNIT PROJECTED AREA, THE AREA BEING THE AREA UPON WHICH THE FLUX IS INCIDENT, OR IS CONSIDERED INCIDENT, AND THE AREA BEING PERPENDICULAR TO THE DIRECTION IN WHICH THE LIGHT WAVE IS PROPAGATING.

LUMINANCE TEMPERATURE

THE TEMPERATURE OF AN IDEAL BLACKBODY THAT WOULD HAVE THE SAME LUMINANCE AS THE SOURCE FOR WHICH THE LUMINANCE TEMPERATURE IS DESIRED FOR SOME NARROW SPECTRAL REGION.

LUMINANCE THRESHOLD

SEE: ABSOLUTE LUMINANCE THRESHOLD.

LUMINESCENCE

THE PROCESS WHEREBY MATTER EMITS ELECTROMAGNETIC RADIATION WHICH, FOR CERTAIN WAVELENGTHS, OR RESTRICTED REGIONS OF THE SPECTRUM, IS IN EXCESS OF THAT ATTRIBUTABLE TO THE THERMAL STATE OF THE MATERIAL AND THE EMISSIVITY OF ITS SURFACE. NOTE: THE RADIATION IS CHARACTERISTIC OF THE PARTICULAR LUMINESCENT MATERIAL, AND OCCURS WITHOUT OUTSIDE STIMULATION. SEE ALSO: PHOSPHORESCENCE.

LUMINESCENT DIODE

SEE: SUPERLUMINESCENT DIODE.

LUMINOSITY

THE RATIO OF LUMINOUS FLUX TO THE RADIANT FLUX IN A SAMPLE OF RADIANT

LIGHT FLUX; FOR EXAMPLE, LUMENS PER WATT OF RADIANT ENERGY. SYNONYM: LUMINOUS EFFICIENCY.

LUMINOSITY CURVE

THE CURVE OBTAINED BY PLOTTING LUMINOUS RELATIVE EFFICIENCY AGAINST THE WAVELENGTH OF A LIGHTWAVE. SEE: ABSOLUTE LUMINOSITY CURVE.

LUMINOUS DENSITY

THE LUMINOUS ENERGY PER UNIT VOLUME OF AN ELECTROMAGNETIC (LIGHT) WAVE.

LUMINOUS EFFICIENCY

THE RATIO OF THE LUMINOUS FLUX EMITTED TO THE POWER CONSUMED BY A SOURCE OF LIGHT; FOR EXAMPLE, LUMENS PER WATT APPLIED AT THE SOURCE.

LUMINOUS EMITTANCE

THE TOTAL LUMINOUS FLUX EMITTED BY A UNIT AREA OF AN EXTENDED SURFACE, IN CONTRAST TO A POINT OR LINE SOURCE.

LUMINOUS FLUX

THE QUANTITY THAT SPECIFIES THE CAPACITY OF THE RADIANT FLUX FROM A LIGHT SOURCE TO PRODUCE THE ATTRIBUTE OF VISUAL SENSATION KNOWN AS BRIGHTNESS. NOTE: LUMINOUS FLUX IS RADIANT FLUX EVALUATED WITH RESPECT TO ITS LUMINOUS EFFICIENCY OF RADIATION. UNLESS OTHERWISE STATED, LUMINOUS FLUX PERTAINS TO THE STANDARD PHOTOPTIC OBSERVER.

LUMINOUS INTENSITY

THE RATIO OF THE LUMINOUS FLUX EMITTED BY A LIGHT SOURCE, OR AN ELEMENT OF THE SOURCE, IN AN INFINITESIMALLY SMALL CONE ABOUT THE GIVEN DIRECTION, TO THE SOLID ANGLE OF THAT CONE, USUALLY STATED AS LUMINOUS FLUX EMITTED PER UNIT SOLID ANGLE.

LUMINOUS RADIATION EFFICIENCY

SEE: LUMINOSITY.

LUMINOUS TRANSMITTANCE

THE RATIO OF THE LUMINOUS FLUX TRANSMITTED BY AN OBJECT TO THE INCIDENT LUMINOUS FLUX.

LUX

A UNIT OF ILLUMINANCE, EQUAL TO A LUMEN INCIDENT PER SQUARE METER OF SURFACE (NORMAL TO THE DIRECTION OF PROPAGATION).

M

MAGNETOOPTIC EFFECT

THE ROTATION OF THE PLANE OF POLARIZATION OF PLANE-POLARIZED LIGHT WAVES IN A MEDIUM BROUGHT ABOUT WHEN SUBJECTING THE MEDIUM TO A MAGNETIC FIELD (FARADAY ROTATION). NOTE: THE EFFECT CAN BE USED TO MODULATE A LIGHT BEAM IN A MATERIAL SINCE MANY PROPERTIES, SUCH AS CONDUCTING VELOCITIES, REFLECTION AND TRANSMISSION COEFFICIENTS AT INTERFACES, ACCEPTANCE ANGLES, CRITICAL ANGLES, AND TRANSMISSION MODES, ARE DEPENDENT UPON THE DIRECTION OF PROPAGATION AT INTERFACES IN THE MEDIA IN WHICH THE LIGHT TRAVELS. THE AMOUNT OF ROTATION IS GIVEN BY A = VHL, WHERE V IS A CONSTANT, H IS THE MAGNETIC FIELD STRENGTH, AND L IS THE DISTANCE. THE MAGNETIC FIELD IS IN THE DIRECTION OF PROPAGATION OF THE LIGHT WAVE. SYNONYM: FARADAY EFFECT.

MAGNIFICATION

THE RATIO OF THE SIZE OF ANY LINEAR DIMENSION OF THE IMAGE TO THAT OF THE OBJECT IN SOME OPTICAL SYSTEM.

SEE: ABSOLUTE MAGNIFICATION; ANGULAR MAGNIFICATION; INDIVIDUAL NORMAL MAGNIFICATION; MAGNIFYING POWER.

MAGNIFIER

AN OPTICAL SYSTEM, SUCH AS A LENS OR LENS SYSTEM, CAPABLE OF FORMING A MAGNIFIED VIRTUAL IMAGE OF AN OBJECT PLACED NEAR ITS FRONT FOCAL POINT. SYNONYMS: LOUPE; SIMPLE MICROSCOPE; MAGNIFYING GLASS. NOTE: MAGNIFICATIONS OF MAGNIFIERS RANGE FROM APPROXIMATELY 3X TO 20X.

MAGNIFYING GLASS

SEE: MAGNIFIER.

MAGNIFYING POWER

THE MEASURE OF THE ABILITY OF AN OPTICAL DEVICE TO MAKE AN OBJECT APPEAR LARGER THAN IT APPEARS TO THE UNAIDED EYE. FOR EXAMPLE, IF AN OPTICAL ELEMENT OR SYSTEM HAS A MAGNIFICATION OF 2-POWER (2X) THE OBJECT WILL APPEAR TWICE AS WIDE AND HIGH. NOTE: THE MAGNIFICATION OF AN OPTICAL INSTRUMENT IS EQUAL TO THE DIAMETER OF THE ENTRANCE PUPIL DIVIDED BY THE DIAMETER OF THE EXIT PUPIL. FOR A TELESCOPIC SYSTEM, THE MAGNIFICATION IS ALSO EQUAL TO THE FOCAL LENGTH OF THE EYEPIECE. ANOTHER EXPRESSION FOR THE MAGNIFICATION OF AN INSTRUMENT IS THE TANGENT OF AN ANGLE IN THE APPARENT FIELD DIVIDED BY THE TANGENT OF THE CORRESPONDING ANGLE IN THE TRUE FIELD. SYNONYM: MAGNIFICATION.

MAJOR

IN OPTICS, A BLANK TO WHICH A PIECE OF GLASS OF A DIFFERENT INDEX OF REFRACTION WILL BE FUSED TO MAKE A MULTIFOCAL LENS.

MANGIN MIRROR

A NEGATIVE MENISCUS LENS WHOSE SECOND, OR CONVEX, SURFACE IS SILVERED. NOTE: SPHERICAL ABERRATION CAN BE CORRECTED FOR ANY GIVEN POSITION OF THE IMAGE BY CAREFULLY CHOOSING THE RADII.

MASER

SEE: MICROWAVE AMPLIFICATION BY STIMULATED EMISSION OF RADIATION; SEE: OPTICAL MASER.

MATCHING MATERIALS

SEE: INDEX-MATCHING MATERIALS.

MATERIAL

SEE: ISOTROPIC MATERIAL.

MATERIAL ABSORPTION

SEE: BULK MATERIAL ABSORPTION.

MATERIAL DISPERSION

IN OPTICAL TRANSMISSION MEDIA USED IN OPTICAL WAVEGUIDES, SUCH AS THE VARIATION IN THE REFRACTIVE INDEX OF A MEDIUM AS A FUNCTION OF WAVELENGTH. OPTICAL FIBERS, SLAB DIELECTRIC WAVEGUIDES, AND INTEGRATED OPTICAL CIRCUITS. NOTE: MATERIAL DISPERSION CONTRIBUTES TO GROUP-DELAY DISTORTION, ALONG WITH WAVEGUIDE - DELAY DISTORTION AND MULTIMODE GROUP-DELAY SPREAD.

THE PART OF THE TOTAL DISPERSION OF AN ELECTROMAGNETIC PULSE IN A WAVEGUIDE CAUSED BY THE CHANGES IN PROPERTIES OF THE MATERIAL WITH WHICH THE WAVEGUIDE SUCH AS AN OPTICAL FIBER IS MADE, DUE TO CHANGES IN FREQUENCY. NOTE: AS WAVELENGTH INCREASES, AND FREQUENCY DECREASES, MATERIAL DISPERSION DECREASES. AT HIGH FREQUENCIES, THE RAPID INTERACTIONS OF THE ELECTROMAGNETIC FIELD WITH THE WAVEGUIDE MATERIAL (OPTICAL FIBER) RENDERS THE REFRACTIVE INDEX EVEN MORE DEPENDENT UPON FREQUENCY.

MATERIAL SCATTERING

SEE: BULK MATERIAL SCATTERING.

MATERIALS

INDEX-MATCHING MATERIALS.

MAXIMUM ACCEPTANCE ANGLE

THE MAXIMUM ANGLE BETWEEN THE LONGITUDINAL AXIS OF AN OPTICAL TRANSMISSION MEDIUM, SUCH AS AN OPTICAL FIBER OR A DEPOSITED OPTICAL FILM, AND THE NORMAL TO THE WAVE FRONT, I.E., THE DIRECTION OF THE ENTERING LIGHT RAY, IN ORDER THAT THESE BE TOTAL INTERNAL REFLECTION OF THE PORTION OF INDIDENT LIGHT, THAT IS TRANSMITTED THROUGH THE FIBER INTERFACE, I.E., THE ANGLE BETWEEN THE TRANSMITTED RAY AND THE NORMAL TO THE INSIDE SURFACE OF THE CLADDING, IS GREATER THAN THE CRITICAL ANGLE. NOTE: THE MAXIMUM ACCEPTANCE ANGLE IS GIVEN BY THE SQUARE ROOT OF THE DIFFERENCE OF THE SQUARES THE INDICES OF REFRACTION OF THE FIBER CORE GLASS AND THE CLADDING. THE SQUARE ROOT OF THE DIFFERENCE OF THE SQUARES IS CALLED THE NUMERICAL ACCEPTANCE (N.A.).

MCVD

SEE: MODIFIED CHEMICAL-VAPOR DEPOSITION PROCESS.

MEAN SPHERICAL INTENSITY

THE AVERAGE VALUE OF INTENSITY OF AN ELECTROMAGNETIC SOURCE OF RADIATION, SUCH AS A LIGHT SOURCE, WITH RESPECT TO ALL DIRECTIONS.

MEASURE

SEE: LENS MEASURE.

MEDIUM

IN OPTICS, ANY SUBSTANCE OR SPACE THROUGH WHICH LIGHT CAN TRAVEL. SEE: LOSSY MEDIUM.

MEDIUM-LOSS FIBER

AN OPTICAL FIBER HAVING A MEDIUM-LEVEL ENERGY LOSS, DUE TO ALL CAUSES, PER UNIT LENGTH OF FIBER, USUALLY MEASURED IN DB/KM AT A SPECIFIED WAVELENGTH. NOTE: MEDIUM-LOSS IS USUALLY CONSIDERED TO BE BETWEEN 20 AND 100 DB/KM. ATTENUATION IN AMPLITUDE OF A PROPAGATING WAVE IS CAUSED PRIMARILY BY SCATTERING DUE TO METAL IONS AND BY ABSORPTION DUE TO WATER IN THE OH RADICAL FORM.

MENISCUS

A LENS HAVING A CONVEX AND A CONCAVE SURFACE. SYNONYM: CONCAVO-CONVEX LENS. SEE: DIVERGENT MENISCUS LENS.

MERIDIAN PLANE

ANY PLANE THAT CONTAINS THE OPTICAL AXIS OF AN OPTICAL SYSTEM, SUCH AS A PLANE THAT CONTAINS THE OPTICAL AXIS OF A ROUND OPTICAL FIBER.

MERIDIONAL RAY

IN AN OPTICAL FIBER, A LIGHT RAY THAT PASSES THROUGH THE AXIS OF THE FIBER WHILE BEING INTERNALLY REFLECTED AND THAT IS CONFINED TO A SINGLE PLANE, CALLED THE MERIDIAN PLANE. SEE ALSO: SKEW RAY.

METER

SEE: PHOTOCONDUCTIVE METER; PHOTOVOLTAIC METER.

MICROBENDING LOSS

IN AN OPTICAL FIBER, THE LOSS OR ATTENUATION IN SIGNAL POWER CAUSED BY SMALL BENDS, KINKS, OR ABRUPT DISCONTINUITIES IN DIRECTION OF THE FIBERS, USUALLY CAUSED BY FIBER CABLING OR BY WRAPPING FIBERS ON DRUMS. NOTE: MICROBENDING LOSSES USUALLY RESULT FROM A COUPLING OF GUIDED MODES AMONG THEMSELVES AND AMONG THE RADIATION MODES.

MICRON

A UNIT OF LENGTH IN THE METRIC SYSTEM EQUAL TO 0.001 MILLIMETER OR 0.000001 METER, I.E. ONE MILLIONTH OF A METER.

MICROSCOPE

SEE: MAGNIFIER.

MICROWAVE AMPLIFICATION BY STIMULATED EMISSION OF RADIATION (MASER)
A LOW-NOISE RADIO-FREQUENCY AMPLIFIER WHOSE EMISSION ENERGY IS STORED IN A MOLECULAR OR ATOMIC SYSTEM BY A MICROWAVE POWER SUPPLY STIMULATED BY THE INPUT SIGNAL.

MIDDLE INFRARED
PERTAINING TO ELECTROMAGNETIC WAVELENGTHS FROM 3 TO 30 MICRONS.

MILLIMICRON
A UNIT OF LENGTH IN THE METRIC SYSTEM EQUAL TO 0.001 MICRON, OR 10 ANGSTROMS.

MINUS LENS
SEE: DIVERGING LENS.

MIRROR
A FLAT SURFACE OPTICALLY GROUND AND POLISHED ON A REFLECTING MATERIAL, OR A TRANSPARENT MATERIAL THAT IS COATED TO MAKE IT REFLECTING, USED FOR REFLECTING LIGHT. NOTE: A BEAM SPLITTING MIRROR HAS A LIGHTLY DEPOSITED METALLIC COATING THAT TRANSMITS A PORTION OF THE INCIDENT LIGHT AND REFLECTS THE REMAINDER.
A SMOOTH HIGHLY POLISHED PLANE OR CURVED SURFACE FOR REFLECTING LIGHT. NOTE: USUALLY A THIN COATING OF SILVER OR ALUMINUM ON GLASS CONSITUTES THE ACTUAL REFLECTING SURFACE. WHEN THIS SURFACE IS APPLIED TO THE FRONT FACE OF THE GLASS, THE MIRROR IS A FRONT-SURFACE MIRROR. SEE: BACK-SURFACE MIRROR; FRONT-SURFACE MIRROR; MANGIN MIRROR; OFF-AXIS PARABOLOIDAL MIRROR; PARABOLOIDAL MIRROR; TRIPLE MIRROR.

MISALIGNMENT LOSS
SEE: ANGULAR MISALIGNMENT LOSS.

MISMATCH LOSS
SEE: REFRACTIVE-INDEX-PROFILE MISMATCH LOSS.

MISMATCH-OF-CORE-RADII LOSS
A LOSS OF SIGNAL POWER INTRODUCED BY AN OPTICAL FIBER SPLICE IN WHICH THE RADII OF THE CORES OF THE TWO FIBERS THAT ARE JOINED ARE NOT EQUAL. NOTE: THE LOSS IS USUALLY EXPRESSED IN DECIBELS (DB).

MIVPO
SEE: MODIFIED INSIDE-VAPOR PHASE-OXIDATION PROCESS.

MIXED-GAS LASER
AN ION LASER THAT USES A MIXTURE OF GASES, SUCH AS ARGON AND KRYPTON, AS THE ACTIVE MEDIUM.

MODAL LOSS

IN AN OPEN WAVEGUIDE, SUCH AS AN OPTICAL FIBER, A LOSS OF ENERGY ON THE PART OF AN ELECTROMAGNETIC WAVE DUE TO OBSTACLES OUTSIDE THE WAVEGUIDE, ABRUPT CHANGES IN DIRECTION OF THE WAVEGUIDE, OR OTHER ANOMALIES, THAT CAUSE CHANGES IN THE PROPAGATION MODE OF THE WAVE IN THE WAVEGUIDE. SEE ALSO: *PROPAGATION MODE.*

MODE
SEE: CLADDING-GUIDED MODE.
SEE: LASER BASIC MODE; PROPAGATION MODE.
SEE: DEGENERATE WAVEGUIDE MODE.

MODE FIBER
SEE: SINGLE-MODE FIBER.

MODES
SEE: COUPLED MODES.

MODE STRIPPER
SEE: CLADDING MODE STRIPPER.

MODE VOLUME
THE NUMBER OF PROPAGATION MODES THAT A WAVEGUIDE, SUCH AS AN OPTICAL FIBER OR A METAL RECTANGULAR PIPE, WILL ALLOW, I.E., SUPPORT. SEE ALSO: PROPAGATION MODE.

MODIFIED CHEMICAL VAPOR DEPOSITION PROCESS (MCVD)
A MODIFIED INSIDE VAPOR PHASE OXIDATION PROCESS FOR PRODUCTION OF OPTICAL FIBERS IN WHICH THE BURNER TRAVELS ALONG THE GLASS TUBE AND THE SOOT PARTICLES ARE CREATED INSIDE THE TUBING RATHER THAN IN THE BURNER FLAME AS IN THE OVPO PROCESS. NOTE: THE CHEMICAL REACTANTS, SUCH AS SILICON TETRACHLORIDE, OXYGEN, AND DOPANTS, ARE CAUSED TO FLOW THROUGH THE ROTATING TUBE OF GLASS AT A PRESSURE OF ABOUT ONE ATMOSPHERE, THE HIGH TEMPERATURE CAUSING THE FORMATION OF OXIDES (SOOT) AND A GLASSY DEPOSIT ON THE INSIDE TUBE SURFACE, AND THE TUBE THEN BEING DRAWN INTO A SOLID FIBER. SYNONYM: MODIFIED INSIDE VAPOR PHASE OXIDATION PROCESS. SEE ALSO: CHEMICAL VAPOR PHASE OXIDATION PROCESS.

MODIFIED INSIDE VAPOR PHASE OXIDATION PROCESS (MIVPO)
SEE: MODIFIED CHEMICAL VAPOR DEPOSITION PROCESS.

MODULATION
SEE: ANALOG-INTENSITY MODULATION; PULSE-POSITION MODULATION.
SEE: ABSORTIVE MODULATION; ELECTROOPTIC PHASE MODULATION; EXTERNAL OPTICAL MODULATION; POLARIZATION MODULATION

MODULATION TRANSFER FUNCTION
IN OPTICS, THE FUNCTION, USUALLY A GRAPH, DESCRIBING THE MODULATION OF THE IMAGE OF A SINUSOIDAL OBJECT AS THE FREQUENCY INCREASES. SYNONYM: SINE WAVE RESPONSE, CONTRAST TRANSFER FUNCTION.

MODULATOR

SEE: INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR; THIN-FILM OPTICAL MODULATOR.

MOLECULAR LASER

A TYPE OF GAS LASER WHOSE ACTIVE MEDIUM IS A MOLECULAR SUBSTANCE (COMPOUND). FOR EXAMPLE, A CARBON DIOXIDE, HYDROGEN CYANIDE, OR WATER VAPOR LASER.

MOLECULAR STUFFING PROCESS (MS)

A PROCESS OF MAKING GRADED REFRACTIVE INDEX OPTICAL FIBERS USING FIVE BROAD STEPS, NAMELY, GLASS MELTING, PHASE SEPARATION, LEACHING, DOPANT INTRODUCTION, AND CONSOLIDATION.

MONOCHROMATIC

PERTAINING TO A COMPOSITION OF ONE COLOR. NOTE: PURELY MONOCHROMATIC LIGHT HAS ALL ITS ENERGY CONFINED TO ONE FREQUENCY, I.E., ONE WAVELENGTH.

MONOCHROMATIC LIGHT

ELECTROMAGNETIC RADIATION, IN THE VISIBLE OR NEAR VISIBLE (LIGHT) PORTION OF THE SPECTRUM, THAT HAS ONLY ONE FREQUENCY OR WAVELENGTH.

MONOCHROMATIC RADIATION

ELECTROMAGNETIC RADIATION THAT HAS ONE FREQUENCY OR WAVELENGTH. SEE ALSO: POLYCHROMATIC RADIATION.

MONOCHROMATOR

AN INSTRUMENT FOR ISOLATING NARROW PORTIONS OF THE SPECTRUM BY MEANS OF DISPERSION OF LIGHT INTO ITS COMPONENT COLORS.

MONORIAL DOUBLE-HETEROJUNCTION DIODE

A LASER DIODE WITH A DOUBLE-HETEROJUNCTION AND A SHIFT AND RETURN-TO-LEVEL OF THE REFRACTIVE INDEX PROFILE THAT HAS THE SPATIAL-PLOT APPEARANCE OF A SQUARE WAVE, I.E. A SUDDEN INCREASE FOLLOWED BY A SUDDEN DECREASE WITH RESPECT TO DISTANCE ACROSS THE JUNCTION.

MOUNTING CEMENT

AN ADHESIVE USED TO HOLD OPTICAL ELEMENTS IN THEIR MOUNTS. IT MAY BE EITHER A THERMOPLASTIC, THERMOSETTING, OR CHEMICAL-HARDENING MATERIAL.

MS

SEE: MOLECULAR STUFFING PROCESS.

MULTI-CHANNEL BUNDLE CABLE

IN OPTICAL FIBER SYSTEMS, TWO OR MORE SINGLE-BUNDLE CABLES ALL IN ONE OUTSIDE JACKET.

MULTI-CHANNEL CABLE

IN OPTICAL FIBER SYSTEMS. TWO OR MORE CABLES COMBINED IN A SINGLE JACKET. HARNESS, STRENGTH-MEMBER, COVER, OR OTHER UNITIZING ELEMENT.

MULTI-CHANNEL SINGLE FIBER CABLE

IN OPTICAL FIBER SYSTEMS. TWO OR MORE SINGLE-FIBER CABLES ALL IN ONE OUTSIDE JACKET.

MULTIFOCAL

IN OPTICS. PERTAINING TO A SYSTEM OR COMPONENT, SUCH AS A LENS OR LENS SYSTEM, THAT HAS, OR IS CHARACTERIZED BY, TWO OR MORE FOCI.

MULTILINE LASER

A MULTIMODE GAS LASER.

MULTIMODE DISPERSION

SEE: OPTICAL MULTIMODE DISPERSION.

MULTIMODE FIBER

AN OPTICAL FIBER WAVEGUIDE THAT WILL ALLOW MORE THAN ONE MODE TO PROPAGATE. NOTE: OPTICAL FIBERS HAVE A MUCH LARGER CORE (25-75 MICRONS) THAN SINGLE-MODE FIBERS (2-8 MICRONS) AND THUS PERMIT NONAXIAL RAYS OR MODES TO PROPAGATE THROUGH THE CORE COMPARED WITH ONLY ONE MODE THROUGH A SINGLE-MODE FIBER.

MULTIMODE GROUP-DELAY SPREAD

IN AN OPTICAL WAVEGUIDE, SUCH AS AN OPTICAL FIBER, SLAB DIELECTRIC WAVEGUIDE, OR INTEGRATED OPTICAL CIRCUIT, THE VARIATION IN GROUP DELAY, DUE TO DIFFERENCES IN GROUP VELOCITY, AMONG THE SUPPORTED PROPAGATING MODES AT A SINGLE FREQUENCY. NOTE: MULTIMODE GROUP-DELAY SPREAD CONTRIBUTES TO GROUP-DELAY DISTORTION, ALONG WITH MATERIAL DISPERSION AND WAVEGUIDE-DELAY DISTORTION. THE SPREAD IN ARRIVAL TIME OF THE EDGES OF A LIGHT PULSE AT THE END OF AN OPTICAL WAVEGUIDE, SUCH AS AN OPTICAL FIBER OR BUNDLE, IS CAUSED BY THE DIFFERENT TIME DELAYS, OR PROPAGATION TIMES, OF THE VARIOUS WAVEGUIDE MODES. THE MODES CAN BE VISUALIZED AS DIFFERENT OPTICAL PATHS OF DIFFERENT LENGTHS, FOR EXAMPLE, PHOTONS OR WAVES PROPAGATING ALONG THE FIBER AXIS REACH THE END OF THE FIBER BEFORE PHOTONS OR WAVES THAT PROPAGATE ALONG SEM-HELICAL OFF-AXIS PATHS, CAUSING OPTICAL PULSE SPREADING (INCREASE IN WIDTH) AND RESULTING INTERSYMBOL INTERFERENCE BEYOND THE BIT-RATE-LENGTH CAPACITY OF THE FIBER. REDUCTION OF SPREADING CAN BE ACCOMPLISHED BY HAVING THE LONGER PATHS BE IN A LOWER-REFRACTIVE-INDEX MEDIUM SO THAT THE WAVE CAN TRAVEL FASTER IN THE LONGER PATHS.

MULTIMODE LASER

A LASER THAT EMITS RADIATION AT TWO OR MORE WAVELENGTHS. IN GAS LASERS, THESE ARE ALSO CALLED MULTILINE LASERS.

MULTIMODE WAVEGUIDE

A WAVEGUIDE CAPABLE OF SUPPORTING MORE THAN ONE ELECTROMAGNETIC WAVE PROPAGATION MODE.

MULTIPLE-BUNDLE CABLE

A NUMBER OF JACKETED OPTICAL FIBER BUNDLES PLACED TOGETHER IN A COMMON, USUALLY CYLINDRICAL, ENVELOPE.

MULTIPLE-BUNDLE CABLE ASSEMBLY

A MULTIPLE BUNDLE OPTICAL FIBER CABLE TERMINATED AND READY FOR INSTALLATION.

MULTIPLE-FIBER CABLE

TWO OR MORE JACKETED FIBERS PLACED TOGETHER IN A COMMON ENVELOPE.

MULTIPLE-FIBER CABLE ASSEMBLY

A MULTIPLE FIBER CABLE TERMINATED AND READY FOR INSTALLATION.

MULTIPLEX

SEE: WAVELENGTH DIVISION MULTIPLEX.

MULTIPLEXER-FILTER

SEE: FIBER-OPTIC ROD MULTIPLEXER-FILTER.

MULTIPLEXER

SEE: THIN-FILM OPTICAL MULTIPLEXER.

MULTIPLEXING

SEE: COLOR-DIVISION MULTIPLEXING.
SEE: OPTICAL SPACE-DIVISION MULTIPLEXING.

MULTIPORT COUPLER

SEE: FIBER-OPTIC MULTIPORT COUPLER.

MULTI-REFRACTING CRYSTAL

A TRANSPARENT CRYSTALLINE SUBSTANCE THAT IS ANISOTROPIC WITH RESPECT WITH RESPECT TO ITS REFRACTIVE INDEX IN DIFFERENT DIRECTIONS. TO THE VELOCITY OF LIGHT TRAVELLING WITHIN IT IN DIFFERENT DIRECTIONS, I.E.

N

NA

SEE: NUMERICAL APERTURE.

NEAR INFRARED

PERTAINING TO ELECTROMAGNETIC WAVELENGTHS FROM 0.75 TO 3 MICRONS.

NEGATIVE LENS

SEE: DIVERGING LENS.

NEGATIVE MENISCUS

SEE: DIVERGENT MENISCUS LENS.

NEGATIVE PHOTODIODE COUPLER

SEE: POSITIVE-INTRINSIC-NEGATIVE PHOTODIODE COUPLER.

NEP

SEE: NOISE EQUIVALENT POWER.

NEWTON'S FRINGES

SEE: NEWTON'S RINGS.

NEWTON'S RINGS

THE SERIES OF RINGS, BANDS, OR FINGES FORMED WHEN TWO CLEAN POLISHED SURFACES ARE PLACED IN CONTACT WITH A THIN AIR FILM BETWEEN THEM AND REFLECTED, USUALLY CHROMATIC, BEAMS OF LIGHT FROM THE TWO ADJACENT SURFACES INTERFERE WITH EACH OTHER, CAUSING ALTERNATE CANCELLATION AND REINFORCEMENT OF LIGHT AS THE DISTANCE BETWEEN THE SURFACES ARE MULTIPLES OR SUBMULTIPLES OF THE WAVELENGTH. NOTE: BY COUNTING THESE BANDS FROM THE POINT OF ACTUAL CONTACT THE DEPARTURE OF ONE SURFACE FROM THE OTHER IS DETERMINED. THE REGULARITY OF THE FRINGES MAPS OUT THE REGULARITY OF THE DISTANCE BETWEEN THE TWO SURFACES. THIS IS THE USUAL METHOD OF DETERMINING THE FIT OF A SURFACE UNDER TEST TO A STANDARD SURFACE OF A TEST GLASS. SYNONYM: NEWTON'S FRINGES.

NOISE

SEE: BLACK NOISE; BLUE NOISE; SHOT NOISE.

NOISE-EQUIVALENT POWER (NEP)

IN OPTICS, THE RMS VALUE OF OPTICAL POWER REQUIRED TO PRODUCE UNITY RMS SIGNAL-TO-NOISE RATIO. NOTE: NEP IS A COMMON PARAMETER IN SPECIFYING DETECTOR PERFORMANCE. NEP IS USEFUL FOR COMPARISON ONLY IF MODULATION FREQUENCY, BANDWIDTH, DETECTOR, AREA AND TEMPERATURE ARE SPECIFIED. TYPICALLY THE REFERENCE BANDWIDTH IS 1 HZ AND THE MODULATION FREQUENCY IS A FEW HUNDRED HERTZ. NEP IS INDICATED IN WATTS.

NOISE-LIMITED OPERATION

SEE: DETECTOR NOISE-LIMITED OPERATION; THERMAL NOISE-LIMITED OPERATION.

NON-COHERENT BUNDLE

A GROUP OF OPTICAL FIBERS RANDOMLY POSITIONED BUT ESSENTIALLY PARALLEL TO

EACH OTHER IN A BUNDLE THAT IS USED SIMPLY AS A MEANS OF GUIDING BEAMS OF LIGHT, WITH NO PARTICULAR SPATIAL RELATIONSHIP AMONG THE FIBERS AT THE BEGINNING OR AT THE END, OR BETWEEN THE ENDS. SYNONYM: LIGHT CONDUIT.

NONRADIATIVE RECOMBINATION

IN AN ELECTROLUMINESCENT DIODE IN WHICH ELECTRONS AND HOLES ARE INJECTED INTO THE P-TYPE AND N-TYPE REGIONS BY APPLICATION OF A FORWARD BIAS, THE RECOMBINATION OF INJECTED MINORITY CARRIERS WITH THE MAJORITY CARRIERS IN SUCH A MANNER THAT THE ENERGY RELEASED UPON RECOMBINATION RESULTS IN HEAT, WHICH IS DISSIPATED PRIMARILY BY CONDUCTION AND SOME THERMAL RADIATION. NOTE: ENERGY RELEASED BY NONRADIATIVE RECOMBINATION IN LEDS DOES NOT CONTRIBUTE TO LIGHT ENERGY FOR OPTICAL USE SUCH AS ENERGIZING OPTICAL FIBERS OR DRIVING INTEGRATED OPTICAL CIRCUITS. SEE ALSO: RADIATIVE RECOMBINATION.

NON-REFLECTIVE COUPLER

AN OPTICAL FIBER COUPLING DEVICE THAT ENABLES SIGNALS IN ONE OR MORE FIBERS TO BE TRANSMITTED TO ONE OR MORE OTHER FIBERS BY ENTERING THE INPUT SIGNAL FIBERS INTO AN OPTICAL FIBER VOLUME WITHOUT AN INTERNAL REFLECTING SURFACE SO THAT THE DIFFUSED SIGNALS PASS DIRECTLY TO THE OUTPUT FIBERS ON THE OPPOSITE SIDE OF THE FIBER VOLUME FOR CONDUCTION AWAY IN ONE OR MORE OF THE OUTPUT FIBERS. NOTE: THE OPTICAL FIBER VOLUME IS A SHAPED PIECE OF THE OPTICAL FIBER MATERIAL TO ACHIEVE TRANSMISSION OF TWO OR MORE INPUTS TO TWO OR MORE OUTPUTS. SEE ALSO: REFLECTIVE STAR-COUPLER; TEE COUPLER.

NORMAL EMERGENCE

IN OPTICS, A CONDITION IN WHICH A RAY EMERGES ALONG THE NORMAL TO THE EMERGENT SURFACE OF A MEDIUM. SEE ALSO: EMERGENCE; GRAZING EMERGENCE.

NORMAL INCIDENCE

PERTAINING TO LIGHT RAYS INCIDENT AT 90-DEGREES TO THE INCIDENT SURFACE.

NORMAL MAGNIFICATION

SEE: INDIVIDUAL NORMAL MAGNIFICATION.

NUMBER

SEE: T-NUMBER.

NUMERICAL APERTURE (NA)

A MEASURE OF THE LIGHT-ACCEPTING PROPERTY OF AN OPTICAL FIBER, E.G., GLASS, GIVEN BY NA = SQUARE ROOT OF THE DIFFERENCE OF THE SQUARES OF THE INDICES OF REFRACTION OF THE CORE N(1), AND THE CLADDING, N(2). NOTE: IF N(1) IS 1.414 (GLASS) AND N(2) IS 1.0 (AIR), THE NUMERICAL APERTURE IS 1.0, AND ALL INCIDENT RAYS WILL BE TRAPPED. NOTE: THE NUMERICAL APERTURE IS A MEASURE OF THE CHARACTERISTIC OF AN OPTIC CONDUCTOR IN TERMS OF ITS ACCEPTANCE OF IMPINGING LIGHT. THE DEGREE OF OPENNESS, LIGHT GATHERING ABILITY, ANGULAR ACCEPTANCE, AND ACCEPTANCE CONE ARE ALL TERMS DESCRIBING THIS CHARACTERISTIC. IT MAY BE NECESSARY TO SPECIFY THAT THE INDICES OF REFRACTION ARE FOR STEP INDEX FIBERS AND FOR GRADED INDEX FIBERS N (1) IS THE MAXIMUM INDEX IN THE CORE AND N(2) IS THE MINIMUM INDEX IN THE CLADDING. AS A NUMBER, THE NA EXPRESSES THE LIGHT-GATHERING POWER OF A FIBER. IT IS

MATHEMATICALLY EQUAL TO THE SINE OF THE ACCEPTANCE ANGLE. AS A FURTHER NOTE: A METHOD OF MEASURING THE NA IS TO EXCITE THE FIBER IN THE VISIBLE REGION AND DISPLAY THE LIGHT EMERGING FROM THE END PERPENDICULARLY ON A SCREEN ABOUT TEN TO THIRTY CENTIMETERS AWAY. THE MEASURED DIAMETER OF THE PROJECTED CIRCLE OF LIGHT DIVIDED BY TWICE THE DISTANCE FROM THE FIBER END TO THE SCREEN IS THE NUMERICAL APERTURE. THE NUMERICAL APERTURE IS ALSO EQUAL TO THE SINE OF THE HALF-ANGLE OF THE WIDEST BUNDLE OF RAYS CAPABLE OF ENTERING A LENS, MULTIPLIED BY THE INDEX OF REFRACTION OF THE MEDIUM CONTAINING THAT BUNDLE OF RAYS, I.E. THE INCIDENT MEDIUM.

NU VALUE
SEE: ABBE CONSTANT.

O

OBJECT
IN AN OPTICAL SYSTEM, THE FIGURE VIEWED THROUGH OR IMAGED BY AN OPTICAL SYSTEM. NOTE: IT MAY CONSIST OF NATURAL OR ARTICIAL STRUCTURES OR TARGETS, OR MAY BE THE REAL OR VIRTUAL IMAGE OF AN OBJECT FORMED BY ANOTHER OPTICAL SYSTEM. IN THE OPTICAL FIELD, AN OBJECT SHOULD BE THOUGHT OF AS AN AGGREGATION OF POINTS. SEE: SINEWAVE OBJECT.

OBJECTIVE
IN AN OPTICAL SYSTEM SUCH AS MICROSCOPES AND TELESCOPES, THE OPTICAL COMPONENT THAT RECEIVES LIGHT FROM THE OBJECT AND FORMS THE FIRST OR PRIMARY IMAGE. NOTE: IN CAMERAS, THE IMAGE FORMED BY THE OBJECTIVE IS THE FINAL IMAGE. IN TELESCOPES AND MICROSCOPES, WHEN USED VISUALLY, THE IMAGE FORMED BY THE OBJECTIVE IS MAGNIFIED BY USE OF AN EYEPIECE.

OBJECT PLANE
IN AN OPTICAL SYSTEM, THE PLANE THAT CONTAINS THE OBJECT POINTS LYING WITHIN THE FIELD OF VIEW.

OCCLUDER
IN OPTICS, A DEVICE THAT COMPLETELY OR PARTIALLY LIMITS THE AMOUNT OF LIGHT REACHING THE EYE.

OFF-AXIS PARABOLOIDAL MIRROR
A PARABOLOIDAL MIRROR THAT CONSISTS OF ONLY A PORTION OF A PARABOLOIDAL SURFACE THROUGH WHICH THE AXIS DOES NOT PASS.

OPAQUE
1. IMPERVIOUS TO LIGHT, I.E., HAS ZERO LUMINOUS TRANSMITTANCE. 2. A

SUBSTANCE THAT IS IMPERVIOUS TO LIGHT APPLIED TO TRANSPARENT OR TRANSLUCENT SUBSTANCES. 3. TO MAKE IMPERVIOUS TO LIGHT.

OPEN WAVE GUIDE

A WAVEGUIDE IN WHICH ELECTROMAGNETIC WAVES ARE GUIDED BY A GRADIENT IN THE REFRACTIVE INDEX SUCH THAT THE WAVES ARE CONFINED TO THE GUIDE BY REFRACTION WITHIN, OR REFLECTION FROM, THE OUTER SURFACE OF THE GUIDE. THUS THE ELECTROMAGNETIC WAVES PROPAGATE, WITHOUT RADIATION, ALONG THE INTERFACE BETWEEN DIFFERENT MEDIA; FOR EXAMPLE, AN OPTICAL FIBER. SEE ALSO: CLOSED WAVEGUIDE.

OPERATION

SEE: DETECTOR NOISE-LIMITED OPERATION; DISPERSION-LIMITED OPERATION; QUANTUM-LIMITED OPERATION; THERMAL-NOISE-LIMITED OPERATION.

OPTIC

SEE: ACOUSTO-OPTIC; ELECTRO-OPTIC.

OPTICAL ADAPTIVE TECHNIQUE

SEE: COHERENT OPTICAL ADAPTIVE TECHNIQUE.

OPTICAL ATTENUATOR

IN AN OPTICAL FIBER DATA LINK OR INTEGRATED OPTICAL CIRCUIT, A DEVICE USED TO REDUCE THE INTENSITY, I.E. ATTENUATE THE LIGHTWAVES WHEN INSERTED INTO AN OPTICAL WAVEGUIDE. NOTE: THREE BASIC FORMS OF OPTICAL ATTENUATORS HAVE BEEN DEVELOPED, NAMELY A FIXED OPTICAL ATTENUATOR, A STEPWISE VARIABLE OPTICAL ATTENUATOR, AND A CONTINUOUS VARIABLE OPTICAL ATTENUATOR. ONE FORM OF ATTENUATOR USES A FILTER CONSISTING OF A METAL FILM EVAPORATED ONTO A SHEET OF GLASS TO OBTAIN THE ATTENUATION. THE FILTER MIGHT BE TILTED TO AVOID REFLECTION BACK INTO THE INPUT OPTICAL FIBER OR CABLE.

SEE: CONTINUOUS VARIABLE OPTICAL ATTENUATOR; FIXED OPTICAL ATTENUATOR; STEPWISE VARIABLE OPTICAL ATTENUATOR.

OPTICAL AXIS

1. THE LINE FORMED BY THE COINCIDING PRINCIPAL AXES OF A SERIES OF OPTICAL ELEMENTS COMPRISING AN OPTICAL SYSTEM. 2. IT IS THE LINE PASSING THROUGH THE CENTERS OF CURVATURES OF THE OPTICAL SURFACES. 3. THE OPTICAL CENTERLINE.

OPTICAL CABLE

SEE: CENTRAL STRENGTH-MEMBER OPTICAL CABLE; PERIPHERAL STRENGTH-MEMBER OPTICAL CABLE.

OPTICAL-CAVITY DIODE

SEE: LARGE OPTICAL-CAVITY DIDODE.

OPTICAL CEMENT

A PERMANENT AND TRANSPARENT ADHESIVE CAPABLE OF WITHSTANDING EXTREMES OF TEMPERATURE. NOTE: CANADA BALSAM IS A CLASSIC OPTICAL CEMENT ALTHOUGH IT

IS BEING REPLACED BY MODERN SYNTHETIC ADHESIVES. SUCH AS METHACRYLATES. CAPRINATES. AND EPOXIES.

OPTICAL CIRCUIT
SEE: INTEGRATED OPTICAL CIRCUIT.

OPTICAL CIRCUIT FILTER-COUPLER-SWITCH MODULATOR
SEE: INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH MODULATOR.

OPTICAL CONDUCTOR
MATERIALS THAT OFFER A LOW OPTICAL ATTENUATION TO TRANSMISSION OF LIGHT ENERGY. NOTE: CONDUCTORS MAY BE ARRANGED AS SINGLE FIBERS, BUNDLES, SINGLE-CHANNEL SINGLE-BUNDLE CABLES, MULTI-CHANNEL SINGLE-FIBER CABLES, SINGLE-CHANNEL SINGLE-FIBER CABLES, MULTI-CHANNEL BUNDLE CABLES, AND MULTI-CHANNEL CABLES.

OPTICAL CONDUCTOR LOSS
SEE: CONNECTOR-INDUCED OPTICAL-CONDUCTOR LOSS.

OPTICAL CONTACT
A CONDITION IN WHICH TWO SUFFICIENTLY CLEAN AND CLOSE FITTING SURFACES ADHERE TOGETHER WITHOUT REFLECTION AT THE INTERFACE. NOTE: THE OPTICALLY CONTACTED SURFACE IS PRACTICALLY AS STRONG AS THE BODY OF THE GLASS.

OPTICAL DATA LINK
A SYSTEM CONSISTING OF A TRANSMITTER, I.E. A LIGHT SOURCE; A FIBER-OPTIC CABLE; AND A RECEIVER, I.E. A PHOTODETECTOR, ALL CONNECTED TOGETHER IN SUCH A MANNER THAT LIGHT WAVES FROM THE SOURCE CAN BE RECEIVED AT THE RECEIVER. NOTE: LIGHT FROM THE TRANSMITTER IS USUALLY MODULATED BY AN INTELLIGENCE-BEARING SIGNAL.

OPTICAL DENSITY
THE LOGARITHM TO THE BASE 10 OF THE RECIPROCAL OF TRANSMITTANCE. SEE: INTERNAL OPTICAL DENSITY.

OPTICAL DETECTOR
A DEVICE THAT CONVERTS OPTICAL POWER OR ENERGY TO OTHER FORMS OF POWER OR ENERGY, SUCH AS LIGHT WAVE POWER TO ELECTRICAL POWER, OR THAT CONTROLS OTHER FORMS OF ENERGY OR POWER IN ACCORDANCE WITH OPTICAL ENERGY INCIDENT UPON ITS SENSITIVE SURFACE.

OPTICAL DIRECTIONAL COUPLER
A DEVICE USED IN OPTICAL FIBER COMMUNICATION SYSTEMS, SUCH AS CATV AND DATA-LINKS FOR OPTICAL FIBER MEASUREMENTS, TO COMBINE OR SPLIT OPTICAL SIGNALS AT DESIRED RATIOS BY INSERTION INTO A TRANSMISSION LINE. FOR EXAMPLE, A THREE-PORT OR FOUR-PORT UNIT WITH PRECISE CONNECTORS AT EACH PORT TO ENABLE INPUTS TO BE COUPLED TOGETHER AND TRANSMITTED VIA MULTIPLE OUTPUTS.

OPTICAL DISPERSION ATTENUATION

THE ATTENUATION, OF A SIGNAL IN AN OPTICAL WAVEGUIDE, CAUSED BY THE FACT THAT EACH FREQUENCY COMPONENT OF A LAUNCHED PULSE IS ATTENUATED SUCH THAT HIGHER FREQUENCIES ARE ATTENUATED MORE THAN THE LOWER FREQUENCIES, GIVING RISE TO ATTENTUATION DISTORTION. NOTE: THE *DISPERSION ATTENUATION FACTOR* IS GIVEN AS EXP NEG AF SQUARED, WHERE A IS A MATERIAL CONSTANT, INCLUDING SUBSTANCE AND GEOMETRY, AND F IS A FREQUENCY COMPONENT OF THE SIGNAL BEING ATTENUATED.

OPTICAL DISTORTION

AN ABERRATION OF SPHERICAL SURFACE OPTICAL SYSTEMS DUE TO THE VARIATION IN MAGNIFICATION WITH DISTANCE FROM THE OPTICAL AXIS.

OPTICAL END-FINISH

THE SURFACE CONDITION AT THE FACE OF AN OPTICAL CONDUCTING MEDIUM.

OPTICAL EMITTER

A SOURCE OF OPTICAL POWER, THAT IS, A SOURCE OF ELECTROMAGNETIC RADIATION IN THE VISIBLE AND NEAR-VISIBLE REGION OF THE FREQUENCY SPECTRUM.

OPTICAL ENERGY DENSITY

THE ENERGY IN A LIGHT BEAM PASSING THROUGH A UNIT AREA NORMAL TO THE DIRECTION OF PROPAGATION OR THE DIRECTION OF MAXIMUM POWER GRADIENT, EXPRESSED IN JOULES PER SQUARE METER.

OPTICAL FIBER

A SINGLE DISCRETE OPTICAL TRANSMISSION ELEMENT USUALLY CONSISTING OF A *FIBER CORE* AND A *FIBER CLADDING*. NOTE: AS A *LIGHT-GUIDANCE SYSTEM* (DI-ELECTRIC WAVEGUIDE) THAT IS USUALLY CYLINDRICAL IN SHAPE, IT CONSISTS EITHER OF A CYLINDER OF TRANSPARENT DIELECTRIC MATERIAL OF GIVEN REFRACTIVE INDEX WHOSE WALLS ARE IN CONTACT WITH A SECOND DIELECTRIC MATERIAL OF A LOWER REFRACTIVE INDEX; OR OF A CYLINDER WHOSE CORE HAS A REFRACTIVE INDEX THAT GETS PROGRESSIVELY LOWER AWAY FROM THE CENTER. THE LENGTH OF A FIBER IS USUALLY MUCH GREATER THAN ITS DIAMETER. THE FIBER RELIES UPON INTERNAL REFLECTION TO TRANSMIT LIGHT ALONG ITS AXIAL LENGTH. LIGHT ENTERS ONE END OF THE FIBER AND EMERGES FROM THE OPPOSITE END WITH LOSSES DEPENDENT UPON LENGTH, ABSORPTION, SCATTERING, AND OTHER FACTORS. A BUNDLE OF FIBERS HAS THE ABILITY TO TRANSMIT A PICTURE FROM ONE OF ITS SURFACES TO ANOTHER, AROUND CURVES, AND INTO OTHERWISE INACCESSIBLE PLACES WITH AN EXTREMELY LOW LOSS OF DEFINITION AND LIGHT, BY THE PROCESS OF TOTAL INTERNAL REFLECTION. EACH FIBER TRANSMITS ONLY ONE ELEMENT OF THE COMPOSITE EMERGENT IMAGE. AS THE DEFINITION IN THE OUTPUT IMAGE DEPENDS ON THE SMALLNESS OF EACH ELEMENT COMPOSING IT, IT IS DESIRABLE TO KEEP THE CROSS-SECTION OF THE INDIVIDUAL FIBERS AS SMALL AS POSSIBLE. IF THE SPACING OF THE FIBERS INCREASES TOWARDS THE OUTPUT END OF THE BUNDLE, THE IMAGE IS MAGNIFIED; IF SPACING IS REDUCED THE IMAGE IS REDUCED IN SIZE. BY CROSSING THE FIBERS SYSTEMATICALLY OR RANDOMLY THE IMAGE IS SCRAMBLED, AND CAN BE RECOVERED BY RETRANSMITTING THE SCRAMBLED IMAGE BACKWARDS THROUGH THE SAME OR EQUIVALENT FIBER BUNDLE.

OPTICAL FIBER BUNDLE

MANY OPTICAL FIBERS IN A SINGLE PROTECTIVE SHEATH OR JACKET. NOTE: THE JACKET IS USUALLY POLYVINYL CHLORIDE (PVC). THE NUMBER OF FIBERS MIGHT RANGE FROM A FEW TO SEVERAL HUNDRED, DEPENDING ON THE APPLICATION AND THE

CHARACTERISTICS OF THE FIBERS.

OPTICAL FIBER COATING

A PROTECTIVE MATERIAL BONDED TO AN OPTICAL FIBER, OVER THE CLADDING IF ANY, TO PRESERVE FIBER STRENGTH AND INHIBIT CABLING LOSSES, BY PROVIDING PROTECTION AGAINST MECHANICAL DAMAGE, PROTECTION AGAINST MOISTURE AND DEBILITATING ENVIRONMENTS, COMPATIBILITY WITH FIBER AND CABLE MANUFACTURE, AND COMPATIBILITY WITH THE JACKETING PROCESS. NOTE: COATINGS INCLUDE FLUORPOLYMERS, TEFLON, KYNAR, POLYURETHANE, AND MANY OTHERS. APPLICATION METHODS INCLUDE DIPCOATING (FOR THOSE IN SOLUTION), EXTRUSION, SPRAY COATING, AND ELECTROSTATIC COATING.

OPTICAL FIBER JACKET

THE MATERIAL THAT COVERS THE BUFFERED OR UNBUFFERED OPTICAL FIBER.

OPTICAL FIBER JUNCTION

AN INTERFACE FORMED BY JOINING THE ENDS OF TWO OPTICAL FIBERS IN A CO-AXIAL (IN-LINE) BUTT JOINT FOR DIRECT FIBER-TO-FIBER TRANSMISSION.

OPTICAL FIBER PREFORM

OPTICAL FIBER MATERIAL, SUCH AS SILICA, OPTICAL GLASS, OR PLASTIC, IN A PARTICULAR SHAPE, SUCH AS A ROD OR HOLLOW TUBE, FROM WHICH AN OPTICAL FIBER IS MADE USUALLY BY DRAWING OR ROLLING, FOR EXAMPLE A SOLID GLASS ROD MADE WITH A HIGHER REFRACTIVE-INDEX THAN THE TUBE INTO WHICH IT IS SLIPPED, TO BE HEATED AND DRAWN OR ROLLED INTO A CLADDED OPTICAL FIBER; OR FOUR LOWER-REFRACTIVE-INDEX RODS SURROUNDING A HIGHER-REFRACTIVE-INDEX ROD HEATED AND DRAWN INTO A CLADDED FIBER. NOTE: THE DRAWING PROCESS RESULTS IN FIBER MANY TIMES LONGER THAN THE PREFORMS.

OPTICAL FIBER TRANSFER FUNCTION

THE TRANSFORMATION THAT AN OPTICAL FIBER BRINGS ABOUT ON AN ELECTRO-MAGNETIC WAVE THAT ENTERS IT, SUCH THAT IF THE INPUT SIGNAL COMPOSITION IS KNOWN, AND THE TRANSFER FUNCTION IS KNOWN FOR THE FIBER, THE OUTPUT SIGNAL CAN BE DETERMINED; FOR EXAMPLE, FTF = EXP NEG AF SQUARE, WHERE FTF IS THE FIBER TRANSFER FUNCTION, A IS A CONSTANT FOR THE FIBER, AND F IS A FREQUENCY COMPONENT OF THE SIGNAL, I.E., OF THE WAVE.

OPTICAL-FIBER TRAP

A HAIR-FINE OPTICAL FIBER THAT IS NEARLY INVISIBLE THAT BREAKS EASILY WHEN STRAINED THAT CAN BE PLACED ON FENCES OR IN FIELDS, THAT CAN SIGNAL THE LOCATION OF A BREAK AND THUS CANNOT BE CUT WITHOUT DETECTION, AND THUS CAN BE USED TO WARN OF TRESPASSERS. SYNONYM: SECURITY OPTICAL FIBER.

OPTICAL FILTER

A COMPONENT OR GROUP OF COMPONENTS PLACED IN AN OPTICAL SYSTEM TO REDUCE OR ELIMINATE CERTAIN SELECTED WAVE-LENGTHS OF TRANSMITTED LIGHT WHILE LEAVING OTHERS RELATIVELY UNCHANGED, OR TO MODIFY THE INTENSITY OR POLARIZATION OF THE LIGHT. SEE ALSO: POLARIZER.

OPTICAL FREQUENCY DIVISION MULTIPLEX

SEE: WAVELENGTH DIVISION MULTIPLEX (WDM).

OPTICAL HARNESS
A NUMBER OF MULTIPLE FIBER CABLES OR JACKETED BUNDLES PLACED TOGETHER IN AN ARRAY THAT CONTAINS BRANCHES. NOTE: A HARNESS IS USUALLY INSTALLED WITHIN OTHER EQUIPMENT AND MECHANICALLY SECURED TO THAT EQUIPMENT.

OPTICAL HARNESS ASSEMBLY
AN OPTICAL HARNESS THAT IS TERMINATED AND READY FOR INSTALLATION.

OPTICAL INTEGRATED CIRCUIT
SEE: INTEGRATED OPTICAL CIRCUIT.

OPTICAL LEVER
THE MEANS OF AMPLIFYING SMALL ANGULAR MOVEMENTS BY REFLECTING A BEAM OF LIGHT FROM A MIRROR OR PRISM.

OPTICAL MASER
A SOURCE OF NEARLY MONOCROMATIC AND COHERENT RADIATION PRODUCED BY THE SYNCHRONOUS AND COOPERATIVE EMISSION OF OPTICALLY PUMPED IONS INTRODUCED INTO A CRYSTAL HOST LATTICE, GAS, OR LIQUID ATOMS EXCITED IN A DISCHARGE TUBE, THE RADIATION BEING A SHARPLY DEFINED FREQUENCY THAT PROPAGATES IN AN INTENSE HIGHLY DIRECTIONAL BEAM.

OPTICAL MODULATION
SEE: EXTERNAL OPTICAL MODULATION.

OPTICAL MODULATOR
SEE: THIN-FILM OPTICAL MODULATOR.

OPTICAL MULTIMODE DISPERSION
A DISPERSION, I.E., FREQUENCY DISTORTION, OF PULSES IN AN OPTICAL WAVEGUIDE CAUSED BY MODE MIXING WHEN TWO OR MORE TRANSMISSION MODES ARE SUPPORTED BY THE SAME FIBER. NOTE: OPTICAL MULTIMODE DISPERSION IS GREATLY REDUCED IN GRADED-INDEX FIBERS, AND SOMEWHAT REDUCED BY USING A MONOCHROMATIC LIGHT SOURCE, SUCH AS A LASER.

OPTICAL MULTIPLEXERS
SEE: THIN-FILM OPTICAL MULTIPLEXERS.

OPTICAL PARAMETRIC OSCILLATOR
A TUNABLE DEVICE, USUALLY A CRYSTAL, THAT VARIES THE WAVELENGTH OF A LIGHT BEAM FROM A SOLID STATE LASER.

OPTICAL PATH LENGTH
IN A MEDIUM OF CONSTANT REFRACTIVE INDEX, N, THE PRODUCT OF THE GEO-

METRICAL DISTANCE AND THE REFRACTIVE INDEX. IF N IS A FUNCTION OF POSITION ALONG THE GEOMETRICAL PATH, THE OPTICAL PATH LENGTH IS THE INTEGRAL OF NDS, WHERE DS IS AN ELEMENT OF LENGTH ALONG THE PATH.

OPTICAL POWER DENSITY
THE ENERGY PER UNIT TIME TRANSMITTED BY A LIGHT BEAM THROUGH A UNIT AREA NORMAL TO THE DIRECTION OF PROPAGATION OR THE DIRECTION OF MAXIMUM POWER GRADIENT, EXPRESSED IN WATTS PER SQUARE METER OR JOULES PER SECOND-(SQUARE-METER).

OPTICAL POWER EFFICIENCY
THE RATIO OF EMITTED ELECTROMAGNETIC POWER OF AN OPTICAL SOURCE TO THE ELECTRICAL INPUT POWER TO THE SOURCE.

OPTICAL PROTECTIVE COATING
FILMS THAT ARE APPLIED TO A COATED OR UNCOATED OPTICAL SURFACE PRIMARILY FOR PROTECTING THE SURFACE FROM MECHANICAL ABRASION, CHEMICAL CORROSION, OR BOTH. NOTE: AN IMPORTANT CLASS OF PROTECTIVE COATINGS CONSISTS OF EVAPORATED THIN FILMS OF TITANIUM DIOXIDE, SILICON MONOXIDE OR MAGNESIUM FLUORIDE. A THIN LAYER OF SILICON MONOXIDE MAY BE ADDED TO PROTECT AN ALUMINIZED SURFACE TO PREVENT CORROSION.

OPTICAL RECEIVER
A DETECTOR, CAPABLE OF DEMODULATING A LIGHT WAVE, THAT CAN BE COUPLED TO A TRANSMISSION MEDIUM SUCH AS AN OPTICAL FIBER.

OPTICAL REPEATER
AN OPTICAL/OPTICAL, OPTICAL/ELECTRICAL, OR ELECTRICAL/OPTICAL SIGNAL AMPLIFICATION AND PROCESSING DEVICE.

OPTICAL ROTATION
1. THE ANGULAR DISPLACEMENT OF THE PLANE OF POLARIZATION OF LIGHT PASSING THROUGH A MEDIUM. 2. THE AZIMUTHAL DISPLACEMENT OF THE FIELD OF VIEW ACHIEVED THROUGH THE USE OF A ROTATING PRISM.

OPTICAL SPACE-DIVISION MULTIPLEXING (OSDM)
THE USE OF INDEPENDENT FIBERS CONTAINED IN A BUNDLE TO PROVIDE OPTICAL PATHS FOR INDEPENDENT CHANNELS. NOTE: USUALLY THE FIBERS ARE COLLECTED INTO A SINGLE CABLE, WITH SHEATHING AND STRENGTH MEMBERS.

OPTICAL SURFACE
IN AN OPTICAL SYSTEM, A REFLECTING OR REFRACTING SURFACE OF AN OPTICAL ELEMENT, OR ANY OTHER IDENTIFIED GEOMETRIC SURFACE IN THE SYSTEM. NOTE: NORMALLY, OPTICAL SURFACES OCCUR AT SURFACES OF DISCONTINUITY (ABRUPT CHANGES) OF FRACTIVE INDICES, ABSORPTIVE QUALITIES, TRANSMISSIVITY, VITRIFICATION, OR OTHER OPTICAL QUALITY OR CHARACTERISTIC.

OPTICAL SWITCH
A SWITCHING CIRCUIT THAT ENABLES SIGNALS IN OPTICAL FIBERS AND INTEGRATED

OPTICAL CIRCUITS (IOC) TO BE SELECTIVELY SWITCHED FROM ONE CIRCUIT OR PATH TO ANOTHER OR TO PERFORM LOGIC OPERATIONS WITH THESE SIGNALS. BY USING ELECTROOPTIC-EFFECTS, MAGNETOOPTIC-EFFECTS, OR OTHER EFFECTS OR METHODS THAT OPERATE ON TRANSMISSION MODES, SUCH AS TRANSVERSE-ELECTRIC VERSUS TRANSVERSE MAGNETIC MODES, TYPE AND DIRECTION OF POLARIZATION, OR OTHER CHARACTERISTICS OF ELECTROMAGNETIC WAVES. SEEL *THIN-FILM OPTICAL SWITCH.* *SEE ALSO: FLIP-CHIP.*

OPTICAL TAPER

AN OPTICAL FIBER WITH A DIAMETER THAT IS A LINEAR FUNCTION OF ITS LENGTH, THUS HAVING A CONICAL SHAPE, EITHER INCREASING OR DECREASING IN DIAMETER IN THE DIRECTION OF PROPAGATION OF A LIGHT WAVE IN A LONGITUDINAL DIRECTION. NOTE: THE TAPER CAN BE USED TO INCREASE OR DECREASE THE SIZE OF AN IMAGE WHEN THE TAPERS ARE BUNDLED. SYNONYM: CONICAL FIBER.

OPTICAL TRANSIMPEDANCE

IN AN OPTICAL TRANSMISSION SYSTEM, THE RATIO OF THE OUTPUT VOLTAGE AT THE DETECTOR END TO THE INPUT CURRENT AT THE SOURCE END.

OPTICAL TRANSMITTER

A SOURCE OF LIGHT CAPABLE OF BEING MODULATED AND COUPLED TO A TRANSMISSION MEDIUM SUCH AS AN OPTICAL FIBER OR AN INTEGRATED OPTICAL CIRCUIT.

OPTICAL VIDEO DISC (OVD)

A DISC ON THE SURFACE OF WHICH DIGITAL DATA IS RECORDED AT HIGH PACKING DENSITIES IN CONCENTRIC CIRCLES OR IN A SPIRAL USING A LASER BEAM TO RECORD SPOTS, THAT ARE READ BY MEANS OF A REFLECTED LASER BEAM OF LOWER INTENSITY THAN THE RECORDING INTENSITY. NOTE: UP TO 10-TO-THE-11TH-POWER BITS ARE BEING RECORDED ON A SINGLE DISC, THUS BEING SUITABLE FOR AN HOUR OF TV PROGRAMMING PLAYBACK.

OPTICAL WAVEGUIDE

SEE: DIFFUSED OPTICAL WAVEGUIDE; FIBER-OPTIC WAVEGUIDE; HETEROEPITAXIAL OPTICAL WAVEGUIDE.

SEE: SLAB-DIELECTRIC OPTICAL WAVEGUIDE; STRIP-LOADED DIFFUSED OPTICAL WAVEGUIDE; THIN-FILM OPTICAL WAVEGUIDE.

OPTIC BUNDLE

SEE: FIBER-OPTIC BUNDLE.

OPTIC CABLE

SEE: FIBER-OPTIC CABLE.

OPTIC COMMUNICATIONS

SEE: FIBER-OPTIC COMMUNICATIONS.

OPTIC CONNECTOR

SEE: FIXED FIBER-OPTIC CONNECTOR; FREE FIBER-OPTIC CONNECTOR.

OPTIC-ELECTRONIC DEVICE
SEE: OPTOELECTRONIC DEVICE.

OPTIC MULTIPORT COUPLER
SEE: FIBER-OPTIC MULTIPORT COUPLER.

OPTIC PROBE
SEE: FIBER-OPTIC PROBE.

OPTIC ROD COUPLER
SEE: FIBER-OPTIC ROD COUPLER.

OPTIC ROD MULTIPLEXER-FILTER
SEE: FIBER-OPTIC ROD MULTIPLEXER-FILTER.

OPTICS
THAT BRANCH OF PHYSICAL SCIENCE CONCERNED WITH THE NATURE AND PROPERTIES OF ELECTROMAGNETIC RADIATION AND WITH THE PHENOMENA OF VISION. SEE: COATED OPTICS; ELECTRON OPTICS; FIBER OPTICS; GEOMETRIC OPTICS; PHYSICAL OPTICS; INTEGRATED OPTICS.
SEE: ACTIVE OPTICS; CRYSTAL OPTICS; GEOMETRIC OPTICS; ULTRAVIOLET FIBER OPTICS.

OPTIC SCRAMBLER
SEE: FIBER-OPTIC SCRAMBLER.

OPTIC SPLICE
SEE: FIBER-OPTIC SPLICE.

OPTIC TERMINUS
SEE: FIBER OPTIC TERMINUS.

OPTIC TRANSMISSION SYSTEM
SEE: FIBER-OPTIC TRANSMISSION SYSTEM; LASER FIBER OPTIC TRANSMISSION SYSTEM.

OPTIC WAVEGUIDE
SEE: FIBER-OPTIC WAVEGUIDE.

OPTOELECTRONIC DEVICE
1. A DEVICE RESPONSIVE TO ELECTROMAGNETIC RADIATION IN THE VISIBLE, INFRARED, OR ULTRAVIOLET SPECTRAL REGIONS OF THE FREQUENCY SPECTRUM: EMITS OR MODIFIES NONCOHERENT OR COHERENT ELECTROMAGNETIC RADIATION IN THESE SAME REGIONS: OR UTILIZES SUCH ELECTROMAGNETIC RADIATION FOR ITS INTERNAL OPERATION. NOTE: THE WAVELENGTHS HANDLED BY THESE DEVICES RANGE FROM APPROXIMATELY 0.3 TO 30 MICRONS. 2. ELECTRONIC DEVICES ASSOCIATED WITH

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LIGHT. SERVING AS SOURCES. CONDUCTORS. OR DETECTORS. SEE ALSO: LIGHT. SYNONYM: OPTIC-ELECTRONIC DEVICE.

ORDER

SEE: DIFFRACTION GRATING SPECTRAL ORDER.

ORDINARY RAY

THE RAY THAT HAS AN ISOTROPIC VELOCITY IN A DOUBLY REFRACTING CRYSTAL. OBEYING SNELL'S LAW UPON REFRACTION AT THE CRYSTAL SURFACE.

OSCILLATOR

SEE: OPTICAL PARAMETRIC OSCILLATOR.

OSDM

SEE: OPTICAL SPACE-DIVISION MULTIPLEXING.

OUTSIDE VAPOR PHASE OXIDATION PROCESS (OVPO)

A CVPO PROCESS. FOR THE PRODUCTION OF OPTICAL FIBER. IN WHICH THE SOOT STREAM. AND HEATING FLAME. IS DEPOSITED ON THE OUTSIDE SURFACE OF THE ROTATING GLASS ROD. SEE ALSO: INSIDE VAPOR PHASE OXIDATION PROCESS; CHEMICAL VAPOR PHASE OXIDATION PROCESS.

OVD

SEE: OPTICAL VIDEO DISC.

OVPO

SEE: OUTSIDE VAPOR-PHASE OXIDATION PROCESS.

OXIDATION PROCESS

SEE: AXIAL VAPOR-PHASE OXIDATION PROCESS; CHEMICAL VAPOR-PHASE OXIDATION PROCESS; INSIDE VAPOR-PHASE OXIDATION PROCESS; MODIFIED INSIDE VAPOR-PHASE OXIDATION PROCESS; OUTSIDE VAPOR-PHASE OXIDATION PROCESS.

P

PACKING DENSITY

IN A BUNDLE OF FIBERS. THE END CROSS-SECTIONAL TOTAL CORE AREA PER UNIT OF CROSS-SECTIONAL AREA OF THE ASSEMBLY OF FIBERS WHOSE CROSS-SECTIONAL CORE AREAS ARE COUNTED. NOTE: PACKING DENSITY VARIES WITH SIZE OF FIBER. CORE AREAS RELATIVE TO TOTAL FIBER. THE GEOMETRIC OR SPATIAL DISTRIBUTION OF FIBERS. THE OVERALL SIZE OF FIBERS. TIGHTNESS OF PACKING. AND OTHER FACTORS.

PACKING FRACTION (PF)

THE RATIO OF THE TOTAL ACTIVE CORE CROSS-SECTIONAL AREA OF A FIBER BUNDLE TO THE TOTAL END AREA OF THE BUNDLE. NOTE: IT MAY BE NECESSARY TO SPECIFY THE CONDITIONS UNDERWHICH THE PACKING FRACTION IS TO BE MEASURED. FOR EXAMPLE, THE END AREA OF A BUNDLE OR CABLE MIGHT BE THE INSIDE AREA OF A TERMINATION OR COUPLER. A PACKING FRACTION MIGHT BE GIVEN AS: PF = N(A/D) SQUARE, WHERE N IS THE NUMBER OF FIBERS, A IS THE DIAMETER OF THE CORE IN EACH FIBER, AND D IS THE DIAMETER OF THE WHOLE ASSEMBLY.

PACKING FRACTION LOSS

THE POWER LOSS, EXPRESSED IN DECIBELS (DB), DUE TO THE PACKING FRACTION.

PACVD

SEE: PLASMA-ACTIVATED CHEMICAL VAPOR DEPOSITION PROCESS.

PANCRATIC LENS

SEE: ZOOM LENS.

PARABOLIC INDEX PROFILE

IN AN OPTICAL FIBER, THE CONDITION OF HAVING THE REFRACTIVE INDEX VARY RADIALLY AS A PARABOLIC FUNCTION OF THE RADIUS, NAMELY IN SUCH A MANNER THAT THE REFRACTIVE INDEX AT ANY RADIUS, R, IS GIVEN BY: N(R) = N(1) (1-A R SQUARE), WHERE R IS THE RADIAL DISTANCE FROM THE FIBER AXIS, A IS A CONSTANT, AND N(1) IS THE REFRACTIVE INDEX AT R = O, I.E. AT THE CENTER. A = DELTA/(B SQUARE), WHERE DELTA = 1 -(N(2)/N(1)) AND B IS THE VALUE OF R FOR WHICH THE INDEX BECOMES UNIFORM. THIS FORMULA IS ALSO WRITTEN AS N(1)(1 -DELTA((R/B) SQUARED), WHERE B IS A CONSTANT.

PARABOLOIDAL MIRROR

A CONCAVE MIRROR THAT HAS THE FORM OF A PARABOLOID OF REVOLUTION. NOTE: THE PARABOLOIDAL MIRROR MAY CONSIST OF ONLY A PORTION OF A PARABOLOIDAL SURFACE THROUGH WHICH THE AXIS DOES NOT PASS. IT IS KNOWN AS AN OFF-AXIS PARABOLOIDAL MIRROR. ALL AXIAL PARALLEL LIGHT RAYS ARE FOCUSSED AT THE FOCAL POINT OF THE PARABOLOID WITHOUT SPHERICAL ABERRATION, AND CONVERSELY ALL LIGHT RAYS EMANATING FROM AN AXIAL SOURCE AT THE FOCAL POINT ARE REFLECTED AS A BUNDLE OF PARALLEL RAYS WITHOUT SPHERICAL ABERRATION. PARABOLOIDAL MIRRORS ARE FREE FROM CHROMATIC ABERRATION. SEE: OFF-AXIS PARABOLOIDAL MIRROR.

PARALLEL LIGHT

SEE: COLLIMATED LIGHT.

PARAMETRIC OSCILLATOR

SEE: OPTICAL PARAMETRIC OSCILLATOR.

PARAXIAL RAY

A RAY OF A GROUP OF RAYS THAT APPROACHES THE CHIEF RAY OF THAT BUNDLE

AS ITS LIMITING POSITION. NOTE: IT IS A RAY IN THE SENSE OF GAUSSIAN OR FIRST ORDER OPTICS. IT IS NEARLY PARALLEL WITH THE OPTICAL AXIS. FOR PURPOSES OF COMPUTATION, THE ANGLE BETWEEN PARAXIAL RAYS AND THE OPTICAL AXIS IS SMALL ENOUGH FOR THE SINE OF THE ANGLE TO BE REPLACED BY THE ANGLE IN RADIANS WITHOUT INTRODUCING SIGNIFICANT ERRORS.

PATH LENGTH
SEE: OPTICAL PATH LENGTH.

PATTERN
SEE: ACCEPTANCE PATTERN; RADIATION PATTERN.

PCS
SEE: PLASTIC-CLAD SILICA FIBER.

PD
SEE: PHOTODETECTOR.

PEAK
SEE: ABSORPTION PEAK.

PEAK RADIANT INTENSITY
THE MAXIMUM VALUE OF RADIANT INTENSITY OF A LIGHTWAVE.

PEAK WAVELENGTH
THE WAVELENGTH AT WHICH THE RADIANT INTENSITY OF A LIGHTWAVE IS A MAXIMUM.

PENCIL
SEE: LIGHT PENCIL.

PENTA PRISM
PRISM HAVING THE UNIQUE PROPERTY OF BEING ABLE TO DIVERT A BEAM OF LIGHT NINETY DEGREES IN THE PRINCIPAL PLANE EVEN IF THE BEAM DOES NOT STRIKE THE END FACES EXACTLY NORMALLY.

PERIPHERAL STRENGTH-MEMBER OPTICAL CABLE
A CABLE CONTAINING OPTICAL FIBERS THAT ARE ON THE INSIDE OF A GROUP OF OUTER HIGH TENSILE-STRENGTH MATERIAL SUCH AS STANDARD OR SOLID CONTRA-HELICAL OR LONGITUDINAL STEEL NYLON, OR OTHER MATERIAL, WITH A CRUSH-RESISTANT JACKETING (SHEATHING) ON THE OUTSIDE OF THE CABLE. SEE ALSO: CENTRAL STRENGTH-MEMBER OPTICAL CABLE.

PF
SEE: PACKING FRACTION.

PHASE MODULATION

SEE: ELECTRCOPTIC PHASE MODULATION.

PHASE CXIDATION PROCESS

SEE: CHEMICAL VAPOR-PHASE OXIDATION PROCESS; INSIDE VAPOR-PHASE OXIDATION PROCESS; MODIFIED INSIDE VAPOR-PHASE OXIDATION PROCESS.

PHASE TERM

IN THE PROPAGATION OF AN ELECTROMAGNETIC WAVE IN A WAVEGUIDE, SUCH AS AN OPTICAL FIBER OR METAL PIPE, THE TERM, H, IN THE EXPRESSION FOR THE EXPONENTIAL VARIATION CHARACTERISTIC OF GUIDED WAVES, EXP(-PZ) = EXP (-IHZ-AZ), THAT REPRESENTS THE PHASE CHANGE PER UNIT OF PROPAGATION DISTANCE OF THE WAVE, CAUSING PULSE DISTORTION. NOTE: THE PHASE TERM, H, IS DEPENDENT UPON THE PERMITTIVITY AND PERMEABILITY OF THE MATERIAL FILLING THE GUIDE, THE FREQUENCY, AND THE MODAL CHARACTERISTICS OF THE PROPAGATING WAVE. SEE ALSO: ATTENUATION TERM; PROPAGATION CONSTANT.

PHOSPHORESCENCE

LUMINESCENCE OF A MATERIAL THAT OCCURS DURING, AND FOR SOME TIME AFTER, THE MATERIAL HAS BEEN STIMULATED BY RADIATION ENERGY. SEE ALSO: LUMINE-SCENCE.

PHOTOCONDUCTION

AN INCREASE IN THE ELECTRICAL CONDUCTION CAPABILITY RESULTING FROM THE ABSORPTION OF ELECTROMAGNETIC RADIATION BY THE MATERIAL.

PHOTOCONDUCTIVE CELL

A DEVICE FOR DETECTING OR MEASURING ELECTROMAGNETIC RADIATION INTENSITY BY VARIATION OF THE CONDUCTIVITY OF A SUBSTANCE CAUSED BY ABSORPTION OF THE RADIATION. SYNONYM: PHOTORESISTIVE CELL, PHOTORESISTOR.

PHOTOCONDUCTIVE DEVICE

A DEVICE THAT MAKES USE OF PHOTOCONDUCTIVITY, SUCH AS A PHOTOCONDUCTIVE CELL.

PHOTOCONDUCTIVE EFFECT

THE PHENOMENON IN WHICH SOME NON-METALLIC MATERIALS EXHIBIT A MARKED INCREASE IN ELECTRICAL CONDUCTIVITY UPON ABSORPTION OF PHOTON ENERGY. PHOTOCONDUCTIVE MATERIALS INCLUDE GASES (IONIZATION) AS WELL AS TO CRYSTALS. THEY ARE USED IN CONJUNCTION WITH SEMICONDUCTOR MATERIALS THAT ARE ORDINARILY POOR CONDUCTORS BUT BECOME DISTINCTLY CONDUCTING WHEN SUBJECTED TO PHOTON ABSORPTION. THE PHOTONS EXCITE ELECTRONS INTO THE CONDUCTION BAND WHERE THEY MOVE FREELY, RESULTING IN GOOD ELECTRICAL CONDUCTIVITY. THE CONDUCT-IVITY INCREASE IS DUE TO THE ADDITIONAL FREE CARRIERS GENERATED WHEN PHOTON ENERGIES ARE ABSORBED IN ENERGY TRANSITIONS. THE RATE AT WHICH FREE CARRIERS ARE GENERATED AND THE LENGTH OF TIME THEY PERSIST IN CONDUCTING STATES (THEIR LIFETIME) DETERMINES THE AMOUNT OF CONDUCTIVITY CHANGE.

PHOTOCONDUCTIVE FILM

A FILM OF MATERIAL WHOSE ELECTRICAL CURRENT-CARRYING ABILITY IS

ENHANCED WHEN ILLUMINATED BY ELECTROMAGNETIC RADIATION, PARTICULARLY IN THE VISIBLE REGION OF THE FREQUENCY SPECTRUM.

PHOTOCONDUCTIVE GAIN FACTOR
THE RATIO OF THE NUMBER OF ELECTRONS PER SECOND FLOWING THROUGH A CIRCUIT CONTAINING A CUBE OF SEMICONDUCTING MATERIAL, WHOSE SIDES ARE OF UNIT LENGTH, TO THE NUMBER OF PHOTONS PER SECOND OF INCIDENT ELECTROMAGNETIC RADIATION ABSORBED IN THIS VOLUME.

PHOTOCONDUCTIVE METER
AN EXPOSURE METER IN WHICH A BATTERY SUPPLIES POWER THROUGH A PHOTOCONDUCTIVE CELL TO AN ELECTRICAL CURRENT MEASURING DEVICE, SUCH AS A MILLIAMMETER, TO MEASURE THE INTENSITY OF RADIATION, SUCH AS LIGHT INTENSITY, INCIDENT UPON ITS ACTIVE SURFACE.

PHOTOCONDUCTIVE PHOTODETECTOR
A PHOTODETECTOR THAT MAKES USE OF THE PHENOMENON OF PHOTOCONDUCTIVITY IN ITS OPERATION. THUS IT DETECTS THE PRESENCE OF ELECTROMAGNETIC RADIATION PARTICULARLY IN THE VISIBLE REGION OF THE FREQUENCY SPECTRUM, BY CHANGING ITS ELECTRICAL RESISTANCE IN ACCORDANCE WITH THE INTENSITY OF THE INCIDENT RADIATION, THUS CONTROLLING THE CURRENT FLOW FROM AN APPLIED BIAS VOLTAGE POWER SOURCE. NOTE: USUALLY A SOURCE OF VOLTAGE IS NEEDED TO DRIVE A CURRENT THAT WILL VARY ACCORDING TO THE VARIATION IN CONDUCTIVITY RESULTING FROM THE VARIATION IN INCIDENT ELECTROMAGNETIC RADIATION.

PHOTOCONDUCTIVITY
THE INCREASE IN ELECTRICAL CONDUCTIVITY DISPLAYED BY MANY MATERIALS, PARTICULARLY NON-METALLIC SOLIDS, WHEN THEY ABSORB ELECTROMAGNETIC RADIATION.

PHOTOCONDUCTOR
A MATERIAL, USUALLY A NONMETALLIC SOLID, WHOSE CONDUCTIVITY INCREASES WHEN IT IS EXPOSED TO ELECTROMAGNETIC RADIATION.

PHOTODETECTOR (PD)
A DEVICE CAPABLE OF EXTRACTING THE INFORMATION FROM AN OPTICAL CARRIER I.E. A THERMAL DETECTOR OR A PHOTON DETECTOR, THE LATTER BEING USED FOR COMMUNICATIONS MORE THAN THE FORMER. SEE: PHOTOCONDUCTIVE PHOTODETECTOR; PHOTOELECTROMAGNETIC PHOTODETECTOR; PHOTOEMISSIVE PHOTODETECTOR; PHOTOVOLTAIC PHOTODETECTOR.

PHOTODETECTOR RESPONSIVITY
THE RATIO OF THE RMS VALUE OF THE OUTPUT CURRENT OR VOLTAGE OF A PHOTODETECTOR TO THE RMS VALUE OF THE INCIDENT OPTICAL POWER INPUT. NOTE: IN MOST CASES, DETECTORS ARE LINEAR IN THE SENSE THAT THE RESPONSIVITY IS INDEPENDENT OF THE INTENSITY OF THE INCIDENT RADIATION. THUS, THE DETECTOR RESPONSE IN AMPS OR VOLTS IS PROPORTIONAL TO INCIDENT OPTICAL POWER, WATTS. DIFFERENTIAL RESPONSIVITY APPLIES TO SMALL VARIATIONS IN OPTICAL POWER. OPTICAL DETECTORS ARE SQUARE LAW DETECTORS THAT RESPOND TO OPTICAL INTENSITY, I.E., THE SQUARE OF THE ELECTROMAGNETIC FIELD ASSOCIATED WITH THE OPTICAL RADIATION. THEY ARE LINEAR IN THE SENSE THAT THE RESPONSE IN VOLTS OR AMPS VARIES LINEARLY WITH OPTICAL POWER INPUT.

PHOTODIODE

SEE: AVALANCHE PHOTODIODE.

PHOTODIODE COUPLER

SEE: AVALANCHE PHOTODIODE COUPLER; POSITIVE-INTRINSIC-NEGATIVE PHOTODIODE COUPLER.

PHOTOEFFECT

SEE: EXTERNAL PHOTOEFFECT; INTERNAL PHOTOEFFECT; EXTRINSIC INTERNAL PHOTOEFFECT; INTRINSIC INTERNAL PHOTOEFFECT.

PHOTOEFFECT DETECTOR

SEE: EXTERNAL PHOTOEFFECT DETECTOR; INTERNAL PHOTOEFFECT DETECTOR.

PHOTOELECTRIC EFFECT

1. THE CHANGES IN MATERIAL ELECTRICAL CHARACTERISTICS DUE TO PHOTON ABSORPTION. 2. THE EMISSION OF ELECTRONS AS THE RESULT OF THE ABSORPTION OF PHOTONS IN A MATERIAL NOTE: THE PHOTONS CAN BE OF ANY ENERGY AND THE ELECTRONS CAN BE RELEASED INTO A VACUUM OR INTO A SECOND MATERIAL. THE MATERIAL ITSELF MAY BE SOLID, LIQUID OR GAS. THUS, PHOTOCONDUCTIVE, PHOTOELECTROMAGNETIC, PHOTOEMISSIVE AND PHOTOVOLTAIC EFFECTS ARE ALL PHOTOELECTRIC EFFECTS.

PHOTOELECTROMAGNETIC EFFECT

THE PRODUCTION OF A POTENTIAL DIFFERENCE BY VIRTUE OF THE INTERACTION OF A MAGNETIC FIELD WITH A PHOTOCONDUCTIVE MATERIAL SUBJECTED TO INCIDENT RADIATION. NOTE: THE INCIDENT RADIATION CREATES HOLE-ELECTRON PAIRS THAT DIFFUSE INTO THE MATERIAL. THE MAGNETIC FIELD CAUSES THE PAIR COMPONENTS TO SEPARATE, RESULTING IN A POTENTIAL DIFFERENCE ACROSS THE MATERIAL. IN MOST APPLICATIONS, THE LIGHT IS MADE TO FALL ON A FLAT SURFACE OF AN INTER-METALLIC SEMICONDUCTOR LOCATED IN A MAGNETIC FIELD THAT IS PARALLEL TO THE SURFACE, EXCESS HOLE-ELECTRON PAIRS ARE CREATED, AND THESE CARRIERS DIFFUSE IN THE DIRECTION OF THE LIGHT BUT ARE DEFLECTED BY THE MAGNETIC FIELD TO GIVE A CURRENT FLOW THROUGH THE SEMICONDUCTOR THAT IS AT RIGHT ANGLES TO BOTH THE LIGHT RAYS AND THE MAGNETIC FIELD. THIS IS DUE TO TRANSVERSE FORCES ACTING ON ELECTRONS AND HOLES DIFFUSING INTO THE SEMI-CONDUCTOR FROM THE SURFACE. SYNONYM: PHOTOMAGNETOELECTRIC EFFECT.

PHOTOELECTROMAGNETIC PHOTODETECTOR

A PHOTODETECTOR THAT MAKES USE OF THE PHOTOELECTROMAGNETIC EFFECT, NAMELY USES AN APPLIED MAGNETIC FIELD.

PHOTOEMISSIVE CELL

A DEVICE THAT DETECTS OR MEASURES RADIANT ENERGY BY MEASUREMENT OF THE RESULTING EMISSION OF ELECTRONS FROM SURFACE THAT HAS OR DISPLAYS A PHOTO-EMISSIVE EFFECT.

PHOTOEMISSIVE EFFECT

THE EJECTION OF ELECTRONS FROM A MATERIAL, USUALLY INTO A VACUUM, AS

A RESULT OF PHOTON ABSORPTION.

PHOTOEMISSIVE PHOTODETECTOR

A PHOTODETECTOR THAT MAKES USE OF THE PHOTOEMISSIVE EFFECT. NOTE: USUALLY AN APPLIED ELECTRIC FIELD IS NECESSARY TO ATTRACT OR COLLECT THE EMITTED ELECTRONS.

PHOTOEMISSIVE TUBE PHOTOMETER

A PHOTOMETER THAT USES A TUBE MADE OF A PHOTOEMISSIVE MATERIAL. NOTE: IT IS HIGHLY ACCURATE, BUT REQUIRES ELECTRONIC AMPLIFICATION, AND IS USED MAINLY IN LABORATORIES.

PHOTOEMISSIVITY

THE PROPERTY OF A SUBSTANCE THAT CAUSES IT TO EMIT ELECTRONS WHEN ELECTROMAGNETIC RADIATION IN THE VISIBLE REGION OF THE FREQUENCY SPECTRUM IS INCIDENT UPON IT. NOTE: NORMALLY AN ELECTRIC FIELD IS APPLIED TO COLLECT THE EMITTED ELECTRONS.

PHOTOMAGNETOELECTRIC EFFECT

SEE: PHOTOELECTROMAGNETIC EFFECT.

PHOTOMETER

SEE: PHOTOEMISSIVE TUBE PHOTOMETER.

PHOTOMETRY

THE SCIENCE DEVOTED TO THE MEASUREMENT OF THE EFFECTS OF ELECTROMAGNETIC RADIATION ON THE EYE. NOTE: PHOTOMETRY IS AN OUTGROWTH OF PSYCHOPHYSICAL ASPECTS, AND INVOLVES THE DETERMINATION OF VISUAL EFFECTIVENESS BY CONSIDERING RADIATED POWER AND THE SENSITIVITY OF THE EYE TO THE FREQUENCY IN QUESTION.

PHOTOMULTIPLIER

AN ELECTRON TUBE THAT MULTIPLIES THE EFFECT OF INCIDENT ELECTROMAGNETIC RADIATION BY ACCELERATING EMITTED ELECTRONS AND USING THEM TO IMPINGE UPON OTHER SURFACES, KNOCKING OUT ADDITIONAL ELECTRONS, UNTIL A LARGE ELECTRIC CURRENT IS PRODUCED FOR LOW INCIDENT RADIATION LEVELS. NOTE: THE ELECTRON TUBE CONTAINS A PHOTOCATHODE, ONE OR MORE DYNODES, AND AN OUTPUT ELECTRODE. ELECTRONS EMITTED FROM THE CATHODE ARE AMPLIFIED BY SECONDARY EMISSION FROM THE DYNODES. THE ORIGINAL ELECTRON EMISSION IS THUS CASCADED BY THE SECONDARY ELECTRODES.

PHOTON

A QUANTUM OF ELECTROMAGNETIC ENERGY. NOTE: THE ENERGY OF A PHOTON IS HF, WHERE H IS PLANCK'S CONSTANT AND F IS THE FREQUENCY OF THE RADIATION. SEE ALSO: PLANCK'S LAW.

PHOTON DETECTOR

A DEVICE THAT RESPONDS TO INCIDENT PHOTONS, I.E. A DEVICE CAPABLE OF SIGNALING, WITH SOME REASONABLE PROBABILITY OF BEING CORRECT, THE ABSORPTION

OF A PHOTON (QUANTUM OF LIGHT ENERGY). NOTE: THE PHOTON DETECTOR EXHIBITS A CHANGE IN PROPERTY WHEN IT ABSORBS A PHOTON, I.E. IT IS PHOTOEMISSIVE, PHOTOCONDUCTIVE, PHOTOVOLTAIC, OR PHOTOELECTROMAGNETIC.

PHOTORESISTIVE CELL
SEE: PHOTOCONDUCTIVE CELL.

PHOTORESISTOR
SEE: PHOTOCONDUCTIVE CELL.

PHOTOTRONIC PHOTOCELL
SEE: PHOTOVOLTAIC PHOTOCELL.

PHOTOVOLTAIC
PERTAINING TO THE CAPABILITY OF GENERATING A VOLTAGE AS A RESULT OF EXPOSURE TO VISIBLE OR OTHER RADIATION.

PHOTOVOLTAIC CELL
A DEVICE THAT DETECTS OR MEASURES RADIANT ENERGY BY THE PRODUCTION OF A SOURCE OF VOLTAGE PROPORTIONAL TO THE INCIDENT RADIATION INTENSITY. NOTE: IT IS POSSIBLE TO OPERATE A PHOTOVOLTAIC CELL WITHOUT AN ADDITIONAL SOURCE OF VOLTAGE, SINCE IT DEVELOPS A VOLTAGE. THE CELL DETECTS OR MEASURES ELECTROMAGNETIC RADIATION BY GENERATING A POTENTIAL AT A JUNCTION (BARRIER LAYER) BETWEEN TWO TYPES OF MATERIAL, UPON ABSORPTION OF RADIANT ENERGY. SYNONYMS: BARRIER-LAYER CELL; BARRIER-LAYER PHOTOCELL; BOUNDARY-LAYER PHOTOCELL; PHOTRONIC PHOTOCELL.

PHOTOVOLTAIC EFFECT
THE PRODUCTION OF AN ELECTROMAGNETIC FORCE (VOLTAGE) ACROSS A SEMICONDUCTOR P-N JUNCTION DUE TO THE ABSORPTION OF PHOTON ENERGY. NOTE: THE POTENTIAL IS CAUSED BY THE DIFFUSION OF HOLE-ELECTRON PAIRS ACROSS THE JUNCTION POTENTIAL BARRIER WHICH THE INCIDENT PHOTONS CAUSE TO SHIFT OR INCREASE, LEADING TO DIRECT CONVERSION OF A PART OF THE ABSORBED ENERGY INTO USABLE ELECTRIC FORCE (VOLTAGE). USUALLY THE PHOTOVOLTAIC EFFECT INVOLVES THE PRODUCTION OF A VOLTAGE IN A NONHOMOGENEOUS SEMICONDUCTOR, SUCH AS SILICON, OR AT A JUNCTION BETWEEN TWO TYPES OF MATERIAL.

PHOTOVOLTAIC METER
AN EXPOSURE CELL IN WHICH A PHOTOVOLTAIC CELL PRODUCES A CURRENT PROPORTIONAL TO THE LIGHT INTENSITY, OR AREA EXPOSED, FALLING ON THE CELL, AND THIS CURRENT IS MEASURED BY A SENSITIVE CURRENT-MEASURING DEVICE, SUCH AS A MICROAMMETER.

PHOTOVOLTAIC PHOTODETECTOR
A PHOTODETECTOR THAT MAKES USE OF THE PHOTOVOLTAIC EFFECT. NOTE: USUALLY A SOURCE OF VOLTAGE IS NOT NEEDED FOR THE PHOTOVOLTAIC PHOTODETECTOR, SINCE IT IS ITS OWN SOURCE OF VOLTAGE.

PHYSICAL OPTICS

THE BRANCH OF OPTICS THAT CONSIDERS LIGHT AS A FORM OF WAVE MOTION. IN WHICH ENERGY IS PROPAGATED BY WAVE FRONTS. I.E. A FORM OF ELECTROMAGNETIC RADIATION OR WAVES.

THE BRANCH OF SCIENCE THAT TREATS LIGHT AS A WAVE PHENOMENON WHEREIN LIGHT PROPAGATION IS STUDIED BY MEANS OF WAVE-FRONTS RATHER THAN RAYS AS IN GEOMETRIC OPTICS.

PICK-OFF COUPLING

SEE: TANGENTIAL COUPLING.

PIN DIODE

A JUNCTION DIODE DOPED IN THE FORWARD DIRECTION POSITIVE. INTRINSIC. AND NEGATIVE. IN THAT ORDER. NOTE: PIN DIODES ARE USED AS PHOTODETECTORS IN FIBER AND INTEGRATED OPTICAL CIRCUITS.

PLANCK'S CONSTANT

A PHYSICAL CONSTANT EQUAL TO 6.626 X 10 EXP(-34) JOULE-SECONDS. SEE ALSO: PLANCK'S LAW.

PLANCK'S LAW

THE QUANTUM OF ENERGY ASSOCIATED WITH AN ELECTROMAGNETIC FIELD OF FREQUENCY F IS E = HF WHERE H IS PLANCK'S CONSTANT (H=6.626X10(-34) JOULE-SEC) AND E IS THE PHOTON ENERGY. NOTE: THE PRODUCT OF ENERGY TIMES THE TIME IS SOMETIMES REFERRED TO AS THE ACTION. HENCE. H IS SOMETIMES REFERRED TO AS THE ELEMENTARY QUANTUM OF ACTION. PLANCK'S LAW IS THE FUNDAMENTAL LAW OF QUANTUM THEORY AND HAS DIRECT APPLICATION IN OPTICAL COMMUNICATIONS (LIGHTWAVE COMMUNICATIONS). IT DESCRIBES THE ESSENTIAL CONCEPT OF THE QUANTA OF ELECTROMAGNETIC ENERGY.

PLANE

SEE: FOCAL PLANE; IMAGE PLANE; OBJECT PLANE.
SEE: MERIDIAN PLANE.

PLANOCONCAVE LENS

A LENS WITH ONE SURFACE PLANE. THE OTHER CONCAVE.

PLANO LENS

A LENS HAVING NO CURVED SURFACE. OR WHOSE TWO CURVED SURFACES NEUTRALIZE EACH OTHER. SO THAT IT POSSESSES NO NET REFRACTING POWER.

PLASMA-ACTIVATED CHEMICAL VAPOR DEPOSITION PROCESS (PACVD)

A CHEMICAL VAPOR DEPOSITION (CVD) PROCESS FOR MAKING GRADED-INDEX (GI) OPTICAL FIBERS BY DEPOSITING A SERIES OF THIN LAYERS OF MATERIALS OF DIFFERENT REFRACTIVE INDICES ON THE INNER WALL OF A GLASS TUBE AS CHEMICAL VAPORS FLOW THROUGH THE TUBE. USING A MICROWAVE CAVITY TO STIMULATE THE FORMATION OF OXIDES BY MEANS OF A NON-ISOTHERMAL PLASMA GENERATED BY THE MICROWAVE RESONANT CAVITY.

PLASTIC-CLAD SILICA FIBER (PCS)

AN OPTICAL FIBER CONSISTING OF A PURE SILICA GLASS CORE WITH PLASTIC CLADDING, THUS, BEING A STEPPED REFRACTIVE-INDEX FIBER. NOTE: LOSS AND DISPERSION ARE GENERALLY HIGHER IN A PLASTIC-CLAD SILICA FIBER THAN IN OTHER TYPES OF FIBERS.

POCKEL CELL
A MATERIAL, USUALLY A CRYSTAL WHOSE REFRACTIVE INDEX CHANGE IS LINEARLY PROPORTIONAL TO AN APPLIED ELECTRIC FIELD, THE MATERIAL BEING CONFIGURED SO AS TO BE PART OF ANOTHER SYSTEM, SUCH AS AN OPTICAL PATH, THE CELL THUS PROVIDING A MEANS OF MODULATING THE LIGHT IN THE OPTICAL PATH.

POINT
SEE: FOCAL POINT; PRINCIPAL FOCUS POINT.

POINTS
SEE: EMISSION-BEAM-ANGLE-BETWEEN-HALF-POWER-POINTS.

POLARISCOPE
A COMBINATION OF A POLARIZER AND AN ANALYZER USED TO DETECT BIREFRINGENCE IN MATERIALS PLACED BETWEEN THEM OR TO DETECT ROTATION IN THE PLANE OF POLARIZATION CAUSED BY MATERIALS PLACED BETWEEN THEM.

POLARIZATION MODULATION
THE MODULATION OF AN ELECTROMAGNETIC WAVE IN SUCH A MANNER THAT THE POLARIZATION OF THE CARRIER WAVE; SUCH AS THE DIRECTION OF POLARIZATION OF THE ELECTRIC AND MAGNETIC FIELDS, OR THEIR RELATIVE PHASING, TO PRODUCE CHANGES IN POLARIZATION ANGLE IN LINEAR, CIRCULAR, OR ELLIPTICAL POLARIZATION; IS VARIED ACCORDING TO A CHARACTERISTIC OF AN INTELLIGENCE-BEARING INPUT SIGNAL, SUCH AS A PULSE-OR-NO-PULSE DIGITAL SIGNAL. NOTE: IN OPTICAL FIBERS OR OTHER WAVE GUIDES, POLARIZATION SHIFTS THAT ARE MADE IN ACCORDANCE WITH AN INPUT SIGNAL VARIATION ARE A PRACTICAL MEANS OF MODULATION.

POLARIZED LIGHT
A LIGHT BEAM WHOSE ELECTRIC VECTOR VIBRATES IN A DIRECTION THAT DOES NOT CHANGE, UNLESS THE PROPAGATION DIRECTION CHANGES, I.E. IT IS IN A SINGLE PLANE CONTAINING THE LINE OF PROPAGATION. NOTE: IF THE TIME-VARYING ELECTRIC VECTOR CAN BE BROKEN INTO TWO PERPENDICULAR COMPONENTS THAT HAVE EQUAL AMPLITUDES AND THAT DIFFER IN PHASE BY 1/4 WAVELENGTH, THE LIGHT IS SAID TO BE CIRCULARLY POLARIZED. CIRCULAR POLARIZATION IS OBTAINED WHENEVER THE PHASE DIFFERENCES BETWEEN THE TWO PERPENDICULAR COMPONENTS IS ANY ODD, INTEGRAL NUMBER OF QUARTER WAVELENGTHS. IF THE ELECTRIC VECTOR IS RESOLVABLE INTO TWO PERPENDICULAR COMPONENTS OF UNLIKE AMPLITUDES AND DIFFERING IN PHASE BY VALUES OTHER THAN 1, 1/4, 1/2, 3/4, 1, ETC., WAVELENGTHS, THE LIGHT BEAM IS SAID TO BE ELLIPTICALLY POLARIZED.

POLARIZER
AN OPTICAL DEVICE CAPABLE OF TRANSFORMING UNPOLARIZED, I.E. DIFFUSED OR SCATTERED LIGHT, INTO POLARIZED LIGHT, OR ALTERING THE POLARIZATION OF POLARIZED LIGHT. SEE ALSO: FILTER.

POLYCHROMATIC RADIATION

ELECTROMAGNETIC RADIATION CONSISTING OF TWO OR MORE FREQUENCIES OR WAVELENGTHS. SEE ALSO: *MONOCHROMATIC RADIATION.*

POLYCHROMATISM

SEE: DICHROISM.

POPULATION INVERSION

1. A REDISTRIBUTION OF ENERGY LEVELS IN A POPULATION OF ELEMENTS SUCH THAT INSTEAD OF HAVING MORE ATOMS WITH LOWER-ENERGY-LEVEL ELECTRONS THERE ARE FEWER ATOMS WITH HIGHER-ENERGY-LEVEL ELECTRONS, I.E. AN INCREASE IN THE TOTAL NUMBER OF ELECTRONS IN THE HIGHER EXCITED STATES OCCURS AT THE EXPENSE OF THE ENERGY IN THE ELECTRONS IN THE GROUND OR LOWER STATE AND AT THE EXPENSE OF THE RESONANT ENERGY SOURCE, I.E. THE PUMP. THIS IS NOT AN EQUILIBRIUM CONDITION. THE GENERATION OF POPULATION INVERSION IS CAUSED BY PUMPING.

2. A CONDITION IN A STIMULATED MATERIAL, SUCH AS A SEMICONDUCTOR, IN WHICH THE UPPER ENERGY LEVEL, OF TWO POSSIBLE ELECTRONIC ENERGY LEVELS, IN A GIVEN ATOM, DISTRIBUTION OF ATOMS, MOLECULE, OR DISTRIBUTION OF MOLECULES, HAS A HIGHER PROBABILITY, USUALLY ONLY SLIGHTLY HIGHER BUT NEVER THE LESS HIGHER, OF BEING OCCUPIED BY AN ELECTRON. NOTE: WHEN POPULATION INVERSION OCCURS, THE PROBABILITY OF DOWNWARD ENERGY TRANSITION GIVING RISE TO RADIATION, IS GREATER THAN THE PROBABILITY OF UPWARD ENERGY TRANSITIONS, GIVING RISE TO PHOTON ABSORPTION, RESULTING IN A NET RADIATION LEVEL, THUS OBTAINING STIMULATED EMISSION, I.E. LASER ACTION.

POSITIVE-INTRINSIC-NEGATIVE PHOTODIODE COUPLER

A COUPLING DEVICE THAT ENABLES THE COUPLING OF LIGHT ENERGY FROM AN OPTICAL FIBER OR CABLE ONTO THE PHOTO SENSITIVE SURFACE OF A POSITIVE-INTRINSIC-NEGATIVE (PIN) DIODE OF A PHOTON DETECTOR (PHOTODETECTOR) AT THE RECEIVING END OF AN OPTICAL FIBER DATA LINK. NOTE: THE COUPLER MAY ONLY BE A FIBER PIGTAIL EPOXIED TO THE PHOTO DIODE.

POSITIVE LENS

SEE: CONVERGING LENS.

POSITION MODULATION

SEE: PULSE-POSITION MODULATION.

POWER

IN OPTICS, A MEASURE OF THE ABILITY OF AN OPTICAL ELEMENT, SUCH AS A MIRROR OR LENS TO BEND OR REFRACT LIGHT, USUALLY MEASURED IN DIOPTERS. NOTE: IN A TELESCOPE, IT IS THE NUMBER OF TIMES THE INSTRUMENT MAGNIFIES THE OBJECT VIEWED. FOR EXAMPLE, IF WITH A SIX-POWER INSTRUMENT, AN OBJECT 600 METERS AWAY IS ENLARGED SIX TIMES, IT APPEARS AS IT WOULD TO THE NAKED EYE IF IT WERE AT A DISTANCE OF ONLY 100 METERS. SEE: BUNDLE RESOLVING POWER; GRATING CHROMATIC RESOLVING POWER; MAGNIFYING POWER; PRISM CHROMATIC RESOLVING POWER.

SEE: AVERAGE POWER; CHROMATIC RESOLVING POWER; NOISE EQUIVALENT POWER; PEAK POWER; RADIANT POWER; RESOLVING POWER; THEORETICAL RESOLVING POWER.

POWER DENSITY
SEE: OPTICAL POWER DENSITY.

POWER EFFICIENCY
SEE: OPTICAL POWER EFFICIENCY.

POWER POINTS
SEE: EMISSION-BEAM-ANGLE BETWEEN HALF-POWER-POINTS.

POWER RATIO
SEE: RADIANT POWER RATIO.

PRECISION-SLEEVE SPLICER
A ROUND TUBE, WITH A ROUND HOLE THAT HAS A DIAMETER EQUAL TO THE OUTER DIAMETER OF TWO OPTICAL FIBERS TO BE SPLICED, CONTAINING A MATCHED-INDEX EPOXY, INTO WHICH THE TWO FIBERS MAY BE INSERTED FROM OPPOSITE ENDS. NOTE: THE ENDS OF THE SLEEVE MAY BE CRIMPED TO HOLD THE FIBERS TIGHTLY WHILE THE EPOXY CURES. SEE ALSO: LOOSE-TUBE SPLICER; TANGENTIAL COUPLING.

PREFORM
SEE: OPTICAL FIBER PREFORM.

PRENTICE'S RULE
A MEANS OF DETERMINING PRISM POWER AT ANY POINT ON A LENS. NOTE: PRISM POWER EQUALS DIOPTRIC POWER MULTIPLIED BY THE DISTANCE IN CENTIMETERS FROM THE OPTICAL CENTER.

PRIMARY SPECTRUM
THE MAIN, FIRST, OR THE CHARACTERISTIC CHROMATIC ABERRATION OF A SIMPLE NONACHROMATIZED LENS OR PRISM. SEE ALSO: SECONDARY SPECTRUM.

PRINCIPAL FOCUS
SEE: FOCAL POINT; PRINCIPAL FOCUS POINT

PRINCIPAL FOCUS POINT
THE POINT TO WHICH INCIDENT PARALLEL RAYS OF LIGHT CONVERGE, OR FROM WHICH THEY DIVERGE WHEN THEY HAVE BEEN ACTED UPON BY A LENS OR MIRROR. A LENS HAS A SINGLE POINT OF PRINCIPAL FOCUS ON EACH SIDE OF THE LENS. A MIRROR HAS BUT ONE PRINCIPAL FOCUS. A LENS OR MIRROR HAS AN INFINITE NUMBER OF IMAGE POINTS, REAL OR VIRTUAL, ONE FOR EACH POSITION OF THE OBJECT. SYNONYM: PRINCIPAL FOCUS.

PRINCIPAL RAY
IN THE OBJECT SPACE OF AN OPTICAL SYSTEM, THE RAY DIRECTED AT THE FIRST PRINCIPAL POINT, AND HENCE IN THE IMAGE SPACE, THE RAY, PROJECTED BACKWARD, INTERSECTING THE AXIS AT THE SECOND PRINCIPAL POINT.

PRINCIPLE
SEE: FERMAT PRINCIPLE.

PRISM
A TRANSPARENT BODY WITH AT LEAST TWO POLISHED PLANE FACES INCLINED WITH RESPECT TO EACH OTHER, FROM WHICH LIGHT IS REFLECTED OR THROUGH WHICH LIGHT IS REFRACTED. NOTE: WHEN LIGHT IS REFRACTED BY A PRISM WHOSE REFRACTIVE INDEX EXCEEDS THAT OF THE SURROUNDING MEDIUM, IT IS DEVIATED OR BENT TOWARD THE THICKER PART OF THE PRISM. SEE: PENTA PRISM.

PRISM CHROMATIC RESOLVING POWER
WHEN PARALLEL RAYS OF LIGHT ARE INCIDENT ON A PRISM, THE PRISM IS ORIENTED AT THE ANGLE OF MINIMUM DEVIATION AT WAVELENGTH L, AND THE ENTIRE HEIGHT OF THE PRISM IS UTILIZED. THE RESOLVING POWER R, DEDUCED ON THE BASIS OF RAYLEIGH'S CRITERION, R = L/DELTA L = B DN/DL, WHERE N IS THE INDEX OF REFRACTION OF THE PRISM FOR THE WAVELENGTH L AND B IS THE MAXIMUM THICKNESS OF PRISM TRAVERSED BY THE LIGHT RAYS. NOTE: THE QUANTITIES DN/DL AND B ARE OFTEN CALLED THE DISPERSION AND BASE-LENGTH OF THE PRISM, RESPECTIVELY.

PRISMOGRAPH
A GRAPHIC DEVICE FOR DETERMINING PRISM POWER.

PROBE
SEE: FIBER-OPTIC PROBE.

PROCESS
SEE: AXIAL VAPOR-PHASE OXIDATION PROCESS; DOUBLE-CRUCIBLE PROCESS; MODIFIED INSIDE-VAPOR PHASE OXIDATION PROCESS; INSIDE VAPOR-PHASE OXIDATION PROCESS; CHEMICAL VAPOR-PHASE OXIDATION PROCESS; MODIFIED CHEMICAL-VAPOR DEPOSITION PROCESS; MOLECULAR STUFFING PROCESS; OUTSIDE VAPOR-PHASE OXIDATION PROCESS; PLASMA-ACTIVATED CHEMICAL VAPOR-DEPOSITION PROCESS.

PRODUCT
SEE: BIT-RATE-LENGTH PRODUCT.
SEE: GAIN-BANDWIDTH PRODUCT.

PROFILE
SEE: GRADED-INDEX PROFILE; PARABOLIC REFRACTIVE-INDEX PROFILE; STEP-INDEX PROFILE; UNIFORM-INDEX PROFILE.

PROFILE FIBER
SEE: UNIFORM-INDEX-PROFILE FIBER.

PROFILE MISMATCH LOSS
SEE: REFRACTIVE-INDEX PROFILE MISMATCH LOSS.

PROPAGATION CONSTANT

IN THE PROPAGATION OF AN ELECTROMAGNETIC WAVE IN A WAVEGUIDE, SUCH AS AN OPTICAL FIBER OR A METAL PIPE, THE FACTOR IN THE EXPRESSION FOR THE EXPONENTIAL VARIATION CHARACTERISTIC OF GUIDED WAVES, VIZ EXP(-PZ)=EXP(-IHZ-AZ). THE TERM, P = IH + A, THAT INCLUDES BOTH THE PHASE TERM, H, AND THE ATTENUATION TERM, A, GOVERNING THE PROPAGATION CHARACTERISTICS OF THE WAVE IN THE GUIDE. DISPERSION OCCURS BECAUSE THE PROPAGATION CONSTANT IS A FUNCTION OF FREQUENCY AND THE MATERIALS OF CONSTRUCTION OF THE GUIDE. SEE ALSO: ATTENUATION TERM; PHASE TERM.

PROPAGATION MODE
AN ALLOWABLE ELECTROMAGNETIC FIELD CONDITION THAT CAN EXIST IN A WAVE GUIDE, INCLUDING TRANSVERSE ELECTRIC OR MAGNETIC RELATIVE TO THE DIRECTION OF PROPAGATION IN THE GUIDE, EACH MODE HAVING A FACTOR (EIGENVALUE) THAT DEFINES THE PROPAGATION CONSTANT, NOT THE ATTENUATION FACTOR, FOR THE DISCRETE MODE. NOTE: THE FIELD CAN BE DESCRIBED IN TERMS OF THESE MODES. DISCONTINUITIES AND BENDS LEADING TO MODE CONVERSION BUT NOT TO RADIATION. IN A CLOSED WAVEGUIDE, STANDING WAVES ESTABLISHED IN THE TRANSVERSE DIRECTION DEFINE THE MODES THAT PROPAGATE IN THE WAVEGUIDE. IN AN OPEN WAVEGUIDE, AN EVANESCENT FIELD IS ESTABLISHED IN THE TRANSVERSE PLANE AND THE MODE IS GUIDED BY THE GRADIENT OF THE INDEX OF REFRACTION. SEE ALSO: MODAL LOSS; MODE VOLUME.

PROTECTIVE COATING
SEE: OPTICAL PROTECTIVE COATING.

PROTECTIVE HOUSING
SEE: LASER PROTECTIVE HOUSING.

PULSE
SEE: GAUSSIAN-SHAPED PULSE.

PULSE DISPERSION
A SEPARATION OR SPREADING OF INPUT OPTICAL SIGNALS ALONG THE LENGTH OF A TRANSMISSION LINE, SUCH AS AN OPTICAL FIBER. NOTE: THIS LIMITS THE USEFUL TRANSMISSION BANDWIDTH OF THE FIBER. IT'S EXPRESSED IN TIME AND DISTANCE AS NANOSECONDS PER KILOMETER. THREE BASIC MECHANISMS FOR DISPERSION ARE THE MATERIAL EFFECT, THE WAVEGUIDE EFFECT, AND THE MULTIMODE EFFECT. SPECIFIC CAUSES INCLUDE SURFACE ROUGHNESS, PRESENCE OF SCATTERING CENTERS, BENDS IN THE GUIDING STRUCTURE, DEFORMATION OF THE GUIDE AND INHOMOGENEITIES OF THE GUIDING MEDIUM. SYNONYM: PULSE SPREADING.

PULSED LASER
SEE: Q-SWITCHED REPETITIVELY-PULSED LASER.

PULSE DUTY FACTOR
THE RATIO OF AVERAGE PULSE DURATION TO AVERAGE PULSE SPACING, THEREFORE A DIMENSIONLESS QUANTITY. NOTE: THE SPACING IS TIME BETWEEN PULSES.

PULSE LENGTH
SEE: LASER PULSE LENGTH.

PULSE-POSITION MODULATION

IN AN OPTICAL TRANSMISSION SYSTEM, MODULATION THAT CAUSES THE ARRIVAL TIME OF PULSES AT A DETECTOR TO VARY ACCORDING TO A SIGNAL IMPRESSED ON A PULSED SOURCE, THE DETECTOR OUTPUT BEING A FUNCTION OF THE ARRIVAL TIME WITH RESPECT TO A FIXED REFERENCE.

PULSE SPREADING

SEE: PULSE DISPERSION.

PULSE WIDTH

SEE: LASER PULSE LENGTH.

PUPIL

SEE: ARTIFICIAL PUPIL; ENTRANCE PUPIL; EXIT PUPIL.

Q

Q-SWITCH

A DEVICE THAT PROHIBITS PULSED LASER EMISSION UNTIL ENERGY INCREASES TO A CERTAIN LEVEL IN THE ACTIVE MEDIUM. PULSE POWER BEING INCREASED BY SHORTENING PULSE DURATION WHILE KEEPING THE PULSE ENERGY CONSTANT. NOTE: THE DEVICE PROVIDES SHORTER AND MORE INTENSE PULSES AT A HIGHER REPETITION RATE THAN COULD BE ACHIEVED BY PULSING THE ACTIVE MEDIUM.

Q-SWITCHED REPETITIVELY-PULSED LASER

A SOLID-STATE LASER WHOSE CONTINUOUS EMISSION IS CONVERTED INTO PULSES BY A Q-SWITCH.

QUALITY

SEE: IMAGE QUALITY.

QUANTITY

SEE: LIGHT QUANTITY.

QUANTUM EFFICIENCY

SEE: DIFFERENTIAL QUANTUM EFFICIENCY; RESPONSE QUANTUM EFFICIENCY.

QUANTUM-LIMITED OPERATION

IN THE OPERATION OF A PHOTODETECTOR, THE INABILITY OF THE DETECTOR TO MEASURE INCIDENT RADIATION LEVELS BELOW A THRESHOLD LEVEL BECAUSE OF FLUCTU-

ATIONS IN THE OUTPUT CURRENT THAT ARE NOT DUE TO INCIDENT RADIATION. I.E. NOT DUE TO INCIDENT PHOTONS.

QUANTUM NOISE
SEE: SHOT NOISE.

R

RADIAL DISTORTION
AN ABERRATION OF LENS SYSTEMS CHARACTERIZED BY THE IMAGING OF AN EXTRA-AXIAL STRAIGHT LINE AS A CURVED LINE WITHOUT NECESSARILY AFFECTING THE DEFINITION. NOTE: UNSYMMETRICAL, OR OTHERWISE IRREGULAR DISTORTIONS OF THE IMAGE CAN ALSO BE CAUSED BY IMPERFECT LOCATION OF OPTICAL CENTERS, OR IRREGULARITY OF OPTICAL SURFACES.

RADIANCE
THE RADIANT INTENSITY OF ELECTROMAGNETIC RADIATION PER UNIT PROJECTED AREA OF A SOURCE OR OTHER AREA, I.E. IT IS THE RADIANT POWER OF ELECTROMAGNETIC RADIATION PER UNIT SOLID ANGLE AND PER UNIT SURFACE AREA NORMAL TO THE DIRECTION CONSIDERED. NOTE: THE SURFACE MAY BE THAT OF A SOURCE DETECTOR, OR IT MAY BE ANY OTHER REAL OR VIRTUAL SURFACE INTERSECTING THE FLUX. THE UNIT OF MEASURE IS WATTS/STERADIAN-SQUARE METER. THE CONCEPT IS USUALLY APPLICABLE TO THE VISIBLE OR NEAR VISIBLE REGION OF THE ELECTROMAGNETIC FREQUENCY SPECTRUM. SYNONYM: EMITTANCE. SEE: SPECTRAL RADIANCE.

RADIANCE CONSERVATION
THE PRINCIPAL THAT STATES THAT PASSIVE OPTICAL PARAPHERNALIA CANNOT INCREASE THE RADIANCE OF A SOURCE, NAMELY, THE RADIANCE OF AN IMAGE CANNOT EXCEED THAT OF THE OBJECT WHEN ENERGY IS NOT ADDED TO THE SYSTEM. SYNONYM: BRIGHTNESS CONSERVATION.

RADIANT EMITTANCE
THE LIGHT FLUX RADIATED PER UNIT AREA OF A SOURCE.

RADIANT ENERGY
THE ENERGY OF ELECTROMAGNETIC WAVES. NOTE: THE NORMAL UNIT OF MEASURE IS THE JOULE. THERE IS NO ASSOCIATED TRANSFER OF MATTER PER SE UNDER THIS CONCEPT.

RADIANT EXITANCE
THE RADIANT POWER EMITTED INTO A FULL SPHERE (4 PI STERADIANS) BY A UNIT AREA OF SOURCE.

RADIANT FLUX
THE TIME RATE OF FLOW OF RADIANT ENERGY. NOTE: THE UNITS ARE WATTS, OR JOULES/SECOND.
2. THE RADIANT ENERGY CROSSING OR STRIKING A SURFACE PER UNIT TIME, USUALLY MEASURED IN WATTS.

RADIANT INTENSITY
THE RADIANT POWER PER UNIT SOLID ANGLE IN THE DIRECTION CONSIDERED, I.E. THE TIME RATE OF TRANSFER OF RADIANT ENERGY PER UNIT SOLID ANGLE, OR THE FLUX RADIATED PER UNIT SOLID ANGLE ABOUT A SPECIFIED DIRECTION. NOTE: THE UNIT OF MEASURE IS WATTS/STERADIAN OR JOULES/(STERADIAN-SECOND). SEE: PEAK RADIANT INTENSITY.

RADIANT POWER
THE TIME RATE OF FLOW OF ELECTROMAGNETIC ENERGY. NOTE: THE UNIT IS WATTS OR JOULES/SECOND.

RADIANT TRANSMITTANCE
THE RATIO OF THE RADIANT FLUX TRANSMITTED BY AN OBJECT TO THE INCIDENT RADIANT FLUX.

RADIATION
THE ELECTROMAGNETIC WAVES OR PHOTONS EMITTED FROM A SOURCE. SEE: MICROWAVE-AMPLIFICATION-BY-STIMULATED-EMISSION-OF-RADIATION; MONOCHROMATIC RADIATION; POLYCHROMATIC RADIATION.
SEE: THERMAL RADIATION.

RADIATION EFFICIENCY
SEE: LUMINOUS RADIATION EFFICIENCY.

RADIATION PATTERN
FOR AN OPTICAL FIBER OR FIBER BUNDLE, THE CURVE OF THE OUTPUT RADIATION INTENSITY PLOTTED AS A FUNCTION OF THE ANGLE BETWEEN THE OPTICAL AXIS OF THE FIBER OR BUNDLE AND A NORMAL TO THE SURFACE ON WHICH THE RADIATION INTENSITY IS BEING MEASURED, I.E. THE OUTPUT RADIATION VERSUS DIRECTION OF MEASUREMENT RELATIVE TO THE OPTICAL AXIS.

RADIATION TEMPERATURE
SEE: TOTAL RADIATION TEMPERATURE.

RADIATIVE RECOMBINATION
IN AN ELECTROLUMINESCENT DIODE IN WHICH ELECTRONS AND HOLES ARE INJECTED INTO THE P-TYPE AND N-TYPE REGIONS BY APPLICATION OF A FORWARD BIAS, THE RECOMBINATION OF INJECTED MINORITY CARRIERS WITH THE MAJORITY CARRIERS IN SUCH A MANNER THAT THE ENERGY RELEASED UPON RECOMBINATION RESULTS IN THE EMISSION OF PHOTONS OF ENERGY HF, WHICH IS APPROXIMATELY EQUAL TO THE BAND-GAP ENERGY. NOTE: RADIATIVE RECOMBINATION PRODUCES THE LIGHT IN A LED, WHICH CAN BE MODULATED FOR SIGNALING PURPOSES USING OPTICAL FIBERS FOR TRANSMISSION OR INTEGRATED OPTICAL CIRCUITS FOR SWITCHING. SEE ALSO:

NONRADIATIVE RECOMBINATION.

RADII LOSS
SEE: MISMATCH-OF-CORE-RADII LOSS

RADIOMETER
AN INSTRUMENT DESIGNED TO MEASURE RADIANT INTENSITY.

RADIOMETRY
THE SCIENCE DEVOTED TO THE MEASUREMENT OF RADIATED ELECTROMAGNETIC POWER. NOTE: IN LIGHT WAVE COMMUNICATIONS AND THE USE OF OPTICAL FIBERS. PRIMARY CONCERN IS DEVOTED TO RADIOMETRY RATHER THAN PHOTOMETRY.

RADIUS
SEE: CRITICAL RADIUS.

RATE
SEE: BIT ERROR RATE (BER).

RATIO
SEE: APERTURE RATIO.
SEE: RADIANT POWER RATIO; SIGNAL-TO-NOISE RATIO.

RAY
SEE: CHIEF RAY; EMERGENT RAY; EXTRAORDINARY RAY; INCIDENT RAY; LIGHT RAY; MERIDIONAL RAY; ORDINARY RAY; PARAXIAL RAY; REFLECTED RAY; SKEW RAY.
SEE: FIELD RAY; PRINCIPAL RAY.

RAYLEIGH SCATTERING
SCATTERING OF A LIGHTWAVE PROPAGATING IN A MATERIAL MEDIUM SUCH AS AN OPTICAL FIBER, DUE TO THE ATOMIC OR MOLECULAR STRUCTURE OF THE MATERIAL AND VARIATIONS IN THE STRUCTURE AS A FUNCTION OF DISTANCE, THE SCATTERING LOSSES VARYING AS THE RECIPROCAL OF THE FOURTH POWER OF THE WAVELENGTH, THE SCATTERING CENTERS BEING SMALL COMPARED TO THE WAVELENGTH. NOTE: RAYLEIGH SCATTERING SETS A THEORETICAL LOWER LIMIT TO THE ATTENUATION OF A PROPAGATING LIGHTWAVE AS A FUNCTION OF WAVELENGTH, RANGING FROM 10 DB/KM AT 0.50 MICRONS TO 1 DB/KM AT 0.95 MICRONS. MATERIAL SCATTERING IS CAUSED PRIMARILY BY RAYLEIGH SCATTERING.

RECEIVER
SEE: OPTICAL RECEIVER.

RECEIVING ELEMENT
THE ACCEPTING TERMINUS OF A JUNCTION OF OPTICAL ELEMENTS.

RECOMBINATION
SEE: NON-RADIATIVE RECOMBINATION; RADIATIVE RECOMBINATION.

REED

SEE: RESTRICTED EDGE-EMITTING DIODE.

REFLECTANGE

THE RATIO OF THE REFLECTED FLUX TO THE INCIDENT FLUX. NOTE: THIS TERM IS APPLIED TO RADIANT AND TO LUMINOUS FLUX. UNLESS QUALIFIED, REFLECTANCE APPLIES TO SPECULAR, OR REGULAR, REFLECTION. SEE: DIFFUSE REFLECTANCE.

REFLECTANCE LOSS

SEE: FRESNEL REFLECTION LOSS.

REFLECTED RAY

THE RAY OF ELECTROMAGNETIC RADIATION, USUALLY LIGHT, LEAVING A REFLECTING SURFACE, REPRESENTING ITS PATH AFTER REFLECTION.

REFLECTION

WHEN ELECTROMAGNETIC WAVES, MORE APPROPRIATELY LIGHT RAYS, STRIKE A SMOOTH, POLISHED SURFACE, THEIR RETURN OR BENDING BACK INTO THE MEDIUM FROM WHENCE THEY CAME. NOTE: SPECULAR OR REGULAR REFLECTION FROM A POLISHED SURFACE, SUCH AS A MIRROR, WILL RETURN A MAJOR PORTION OF THE LIGHT IN A DEFINITE DIRECTION LYING IN THE PLANE OF THE INCIDENT RAY AND THE NORMAL. AFTER SPECULAR REFLECTION, LIGHT CAN BE MADE TO FORM A SHARP IMAGE OF THE ORIGINAL SOURCE. DIFFUSE RELECTION OCCURS WHEN THE SURFACE IS ROUGH AND THE REFLECTED LIGHT IS SCATTERED FROM EACH POINT IN THE SURFACE. THESE DIFFUSE RAYS CANNOT BE MADE TO FORM AN IMAGE OF THE ORIGINAL SOURCE, BUT ONLY OF THE DIFFUSELY REFLECTING SURFACE ITESELF. SEE: TOTAL INTERNAL REFLECTION. SEE ALSO: SNELL'S LAW.

REFLECTION ANGLE

WHEN A RAY OF ELECTROMAGNETIC RADIATION STRIKES A SURFACE, AND IS REFLECTED IN WHOLE OR IN PART BY THE SURFACE, THE ANGLE BETWEEN THE NORMAL TOTAL REFLECTING SURFACE AND THE REFLECTED RAY. SEE: CRITICAL ANGLE.

REFLECTION COEFFICIENT

THE RATIO OF THE REFLECTED FIELD STRENGTH TO THE INCIDENT FIELD STRENGTH WHEN AN ELECTROMAGNETIC WAVE IS INCIDENT UPON AN INTERFACE SURFACE BETWEEN DIELECTRIC MEDIA OF DIFFERENT INDICES OF REFRACTION. NOTE: IF, AT OBLIQUE INCIDENCE, THE ELECTRIC FIELD COMPONENT OF THE INCIDENT WAVE IS PARALLEL TO THE INTERFACE, THE REFLECTION COEFFICIENT IS GIVEN BY: R = (N(2)COSA - N(1)COS B)/(N(2)COSA + N(1)COS B) WHERE N(1) AND N(2) ARE THE INDICES OF REFRACTION OF THE INCIDENT AND TRANSMITTED MEDIUM, RESPECTIVE-LY, AND A AND B ARE THE ANGLES OF INCIDENCE AND REFRACTION (WITH RESPECT TO NORMAL), RESPECTIVELY. IF, AT OBLIQUE INCIDENCE, THE MAGNETIC FIELD COMPONENT OF THE INCIDENT WAVE IS PARALLEL TO THE INTERFACE, THE REFLECTION COEFFICIENT IS GIVEN BY: R = (N(1)COSA - N(2)COS B)/(N(1)COS A + N(2)COS B). THESE EQUATIONS ARE KNOWN AS THE FRESNEL EQUATIONS FOR THESE CASES. SEE ALSO: FRESNEL REFLECTION LOSS; TRANSMISSION COEFFICIENT.

REFLECTION IMAGE

AN IMAGE FORMED BY A REFLECTING SURFACE. NOTE: AN UNWANTED REFLECTION

IMAGE IS A GHOST IMAGE.

REFLECTION LAW
WHEN A RAY OF ELECTROMAGNETIC RADIATION STRIKES A SURFACE AND IS REFLECTED IN WHOLE OR IN PART BY THE SURFACE, THE ANGLE OF REFLECTION IS EQUAL TO THE ANGLE OF INCIDENCE, THE INCIDENT RAY, REFLECTED RAY, AND NORMAL ALL BEING IN THE SAME PLANE.

REFLECTION LOSS
SEE: FRESNEL REFLECTION LOSS.

REFLECTIVE COATING
SEE: HIGHLY-REFLECTIVE COATING.

REFLECTIVE STAR-COUPLER
AN OPTICAL FIBER COUPLING DEVICE THAT ENABLES SIGNALS IN ONE OR MORE FIBERS TO BE TRANSMITTED TO ONE OR MORE OTHER FIBERS BY ENTERING THE SIGNALS INTO ONE SIDE OF AN OPTICAL CYLINDER, FIBER, OR OTHER PIECE OF MATERIAL, WITH A REFLECTING BACK SURFACE SO AS TO REFLECT THE DIFFUSED SIGNALS BACK TO THE OUTPUT PORTS ON THE SAME SIDE OF THE MATERIAL, FOR CONDUCTION AWAY IN ONE OR MORE FIBERS. SEE ALSO: TEE COUPLER; NON-REFLECTIVE STAR-COUPLER.

REFLECTIVITY
THE REFLECTANCE OF AN OPAQUE MATERIAL, THAT IS, OF A LAYER OF MATERIAL OF SUFFICIENT THICKNESS SO THAT FURTHER INCREASES IN THICKNESS DO NOT ALTER THE REFLECTANCE. SEE: SPECTRAL REFLECTIVITY.

REFLECTOR
SEE: TRIPLE MIRROR.

REFRACTION
THE BENDING OF OBLIQUE (NON-NORMAL) INCIDENT ELECTROMAGNETIC WAVES OR RAYS AS THEY PASS FROM A MEDIUM OF ONE INDEX OF REFRACTION INTO A MEDIUM OF A DIFFERENT INDEX OF REFRACTION, COUPLED WITH THE CHANGING OF THE VELOCITY OF PROPAGATION OF THE ELECTROMAGNETIC WAVES WHEN PASSING FROM ONE MEDIUM TO ANOTHER WITH DIFFERENT INDICES OF REFRACTION. NOTE: THE WAVES OR RAYS ARE USUALLY CHANGED IN DIRECTION, I.E., BENT, CROSSING THE MEDIA INTERFACE. SEE: REFRACTIVE INDEX. SEE ALSO: SNELL'S LAW.

REFRACTION ANGLE
WHEN AN ELECTROMAGNETIC WAVE STRIKES A SURFACE AND IS WHOLLY OR PARTIALLY TRANSMITTED INTO THE NEW MEDIUM, OF WHICH THE STRUCK SURFACE IS THE BOUNDARY, THE ACUTE ANGLE BETWEEN THE NORMAL TO THE REFRACTING SURFACE AT THE POINT OF INCIDENCE, AND THE REFRACTED RAY.

REFRACTION LAW
SEE: SNELL'S LAW.

REFRACTING CRYSTAL

SEE: DOUBLY-REFRACTING CRYSTAL; MULTI-REFRACTING CRYSTAL.

REFRACTIVE INDEX

1. THE RATIO OF THE VELOCITY OF LIGHT IN A VACUUM TO THE VELOCITY OF LIGHT IN THE MEDIUM WHOSE INDEX OF REFRACTION IS DESIRED. FOR EXAMPLE, N = 2.6 FOR CERTAIN KINDS OF GLASS. 2. THE RATIO OF THE SINES OF THE ANGLE OF INCIDENCE AND THE ANGLE OF REFRACTION WHEN LIGHT PASSES FROM ONE MEDIUM TO ANOTHER. NOTE: THE INDEX BETWEEN TWO MEDIA IS THE RELATIVE INDEX, WHILE THE INDEX WHEN THE FIRST MEDIUM IS A VACUUM IS THE ABSOLUTE INDEX OF THE SECOND MEDIUM. THE INDEX OF REFRACTION EXPRESSED IN TABLES IS THE ABSOLUTE INDEX, THAT IS, VACUUM TO SUBSTANCE AT A CERTAIN TEMPERATURE, WITH LIGHT OF A CERTAIN WAVELENGTH. EXAMPLES: VACUUM 1.000, AIR, 1.000292; WATER, 1.333; ORDINARY CROWN GLASS, 1.516. SINCE THE INDEX OF AIR IS VERY CLOSE TO THAT OF VACUUM, THE TWO ARE OFTEN USED INTERCHANGEABLY. SYNONYM: ABSOLUTE REFRACTIVE INDEX; INDEX-OF-REFRACTION.

REFRACTIVE-INDEX-PROFILE MISMATCH LOSS

A LOSS OF SIGNAL POWER INTRODUCED BY AN OPTICAL FIBER SPLICE OF TWO OPTICAL FIBERS WHOSE GRADED INDICES OF REFRACTION ARE NOT THE SAME.

REPEATER

SEE: OPTICAL REPEATER.

REPETITIVELY-PULSED LASER

SEE: Q-SWITCHED REPETITIVELY-PULSED LASER.

RESOLUTION ANGLE

SEE: LIMITING RESOLUTION ANGLE.

RESOLVING POWER

A MEASURE OF THE ABILITY OF A LENS OR OPTICAL SYSTEM TO FORM SEPARATE AND DISTINCT IMAGES OF TWO OBJECTS CLOSE TOGETHER. NOTE: BECAUSE OF DIFFRACTION AT THE APERTURE, NO OPTICAL SYSTEM CAN FORM A PERFECT IMAGE OF A POINT, BUT PRODUCES INSTEAD A SMALL DISK OF LIGHT (AIRY DISK) SURROUNDED BY ALTERNATELY DARK AND BRIGHT CONCENTRIC RINGS. WHEN TWO OBJECT POINTS ARE AT THAT CRITICAL SEPARATION FROM WHICH THE FIRST DARK RING OF ONE DIFFRACTION PATTERN FALLS UPON THE CENTRAL DISK OF THE OTHER, THE POINTS ARE JUST RESOLVED, I.E. DISTINGUISHED AS SEPARATED, AND THE POINTS ARE SAID TO BE AT THE LIMIT OF RESOLUTION. SEE: CHROMATIC RESOLVING POWER; THEORETICAL RESOLVING POWER.

SEE: BUNDLE RESOLVING POWER; GRATING CHROMATIC RESOLVING POWER; PRISM CHROMATIC RESOLVING POWER.

RESPONSE

SEE: EDGE-RESPONSE.

RESPONSE QUANTUM EFFICIENCY

THE RATIO OF THE NUMBER OF COUNTABLE OUTPUT EVENTS TO THE NUMBER

OF INCIDENT PHOTONS THAT OCCUR WHEN ELECTROMAGNETIC ENERGY IS INCIDENT UPON A MATERIAL. OFTEN MEASURED AS ELECTRONS EMITTED PER INCIDENT PHOTON. NOTE: RESPONSE QUANTUM EFFICIENCY IS A MEASURE OF THE EFFICIENCY OF CONVERSION OR UTILIZATION OF OPTICAL ENERGY. BEING AN INDICATION OF THE NUMBER OF EVENTS PRODUCED FOR EACH INCIDENT QUANTUM FOR A PHOTODETECTOR. IT IS A MEASURE OF THE PROBABILITY THAT THE PHOTODETECTOR TRIGGERS A MEASUREABLE EVENT WHEN A PHOTON IS INCIDENT. QUANTUM EFFICIENY IS AN INTRINSIC QUALITY OF MATERIALS. A FUNCTION OF WAVELENGTH. ANGLE OF INCIDENCE AND POLARIZATION OF THE INCIDENT ELECTROMAGNETIC FIELD. NORMALLY. IT IS THE NUMBER OF ELECTRONS RELEASED OR EMITTED. ON THE AVERAGE. FOR EACH INCIDENT PHOTON. AND CAN BE DETERMINED EXPERIMENTALLY. THE CREATION OF AN ELECTRON-HOLE PAIR BY AN INCIDENT PHOTON IS A COMPLEX PROBABALISTIC PHENOMENA THAT DEPENDS ON THE DETAILS OF THE ENERGY BAND STRUCTURE OF THE MATERIAL.

RESPONSIVITY

SEE: PHOTODETECTOR RESPONSIVITY.

RESTRICTED EDGE-EMITTING DIODE (REED)

AN EDGE-EMITTING LED. I.E. A LIGHT-EMITTING DIODE IN WHICH LIGHT IS EMITTED ONLY OVER A SMALL PORTION OF AN EDGE. NOTE: THE RESTRICTED LIGHT-EMITTING REGION IMPROVES COUPLING EFFICIENCY WITH OPTICAL FIBERS AND INTEGRATED OPTICAL CIRCUITS.

RETICLE

A SCALE. INDICATOR. OR PATTERN PLACED IN ONE OF THE FOCAL PLANES OF AN OPTICAL INSTRUMENT THAT APPEARS TO THE OBSERVER TO BE SUPERIMPOSED UPON THE FIELD OF VIEW. NOTE: RETICLES. IN VARIOUS PATTERNS. ARE USED TO DETERMINE THE CENTER OF THE FIELD OR TO ASSIST IN THE GAGING OF DISTANCE. DETERMINING LEADS. OR MEASUREMENT. A RECTICLE MAY CONSIST OF FINE WIRES. OR FIBERS. MOUNTED ON A SUPPORT AT THE ENDS. OR MAY BE ETCHED ON A CLEAR. SCRUPULOUSLY POLISHED AND CLEANED PLANE PARALLEL PLATE OF GLASS. IN WHICH CASE THE ENTIRE PIECE OF GLASS IS THE RETICLE.

RETRODIRECTIVE REFLECTOR

SEE: TRIPLE MIRROR.

REVERTED

IN OPTICAL SYSTEMS. TURNED THE OPPOSITE WAY SO THAT RIGHT BECOMES LEFT. AND VICE VERSA. SUCH AS THE EFFECT PRODUCED BY A MIRROR IN REFLECTING AN IMAGE.

REVERTED IMAGE

IN AN OPTICAL SYSTEM. AN IMAGE. THE RIGHT SIDE OF WHICH APPEARS TO BE THE LEFT SIDE. AND VICE VERSA.

RICHARDSON'S LAW

THE BASIC LAW OF THERMIONIC EMISSION. EXPRESSED BY THE RICHARDSON DUSHMAN EQUATION. I.E. THE CURRENT DENSITY (AMPS/SQUARE METER) DUE TO THERMAL EXCITATION IN THE CATHODE MATERIAL. IS J = AT (SQUARE) EXP (-BQ/KT). WHERE T IS THE CATHODE TEMPERATURE (ABSOLUTE). K IS THE BOLTZMANN CONSTANT AND A IS A CONSTANT. THE THEORETICAL VALUE OF A IS 1.2X10 AMPS/SQUARE METER BUT

DEPARTURES FROM THIS VALUE OCCUR; G IS THE ELECTRONIC CHARGE AND B IS THE WORK FUNCTION, JOULES/COULOMB, FOR THE CATHODE MATERIAL. NOTICE THAT THIS EXPONENTIAL FUNCTION IS QUITE STEEP; K=1.38X10(-23) JOULES/KELVIN.

RINGS
SEE: NEWTON'S RINGS.

ROD COUPLER
SEE: FIBER-OPTIC ROD COUPLER.

ROD MULTIPLEXER-FILTER
SEE: FIBER-OPTIC ROD MULTIPLEXER-FILTER.

ROTATION
SEE: OPTICAL ROTATION.

ROTATOR
SEE: IMAGE ROTATOR.

RULE
SEE: PRENTICE'S RULE.

RUN
SEE: CABLE RUN.

S

SCANNING
SEE: DYNAMIC SCANNING.

SCATTERED SEED
A FEW, OCCASIONAL, EASILY VISIBLE COARSE SEEDS. NOTE: SEVERAL MAY BE SPACED 2 OR 3 CENTIMETERS APART, BUT ONE HERE AND THERE AT MUCH GREATER DISTANCE APART IS MORE USUAL.

SCATTERING
SEE: BULK MATERIAL SCATTERING; FIBER SCATTERING; RAYLEIGH SCATTERING.

SCATTERING COEFFICIENT

IN THE TRANSMISSION OF ELECTROMAGNETIC WAVES, THE PART OF THE CONSTANT COEFFICIENT DUE TO SCATTERING IN THE EXPONENT OF THE EXPRESSION THAT DESCRIBES BOUGER'S LAW. NOTE: ABSORPTION ALSO CONTRIBUTES TO THE TOTAL COEFFICIENT. IT IS DEPENDENT UPON THE MATERIALS, SUCH AS IMPURITIES AND INTRINSIC MATERIAL, IN WHICH THE WAVES ARE PROPAGATING.

SCATTERING LOSS
POWER LOSS BY AN ELECTROMAGNETIC WAVE DUE TO RANDOM REFLECTIONS AND DEFLECTIONS OF THE WAVES CAUSED BY THE MATERIAL ELEMENTS IN THE MEDIUM IN WHICH THE WAVES ARE PROPAGATING AS WELL AS BY IMPURITIES, IMBEDDED PARTICLES, AND INCLUSIONS.

SCOPE
SEE: FIBERSCOPE.

SCRAMBLER
SEE: FIBER-OPTIC SCRAMBLER.

SCRATCH
IN OPTICS, A MARKING OR TEARING OF THE SURFACE APPEARING AS THOUGH IT HAD BEEN DONE BY EITHER A SHARP OR ROUGH INSTRUMENT. NOTE: SCRATCHES OCCUR ON SHEET GLASS IN ALL DEGREES FROM VARIOUS ACCIDENTAL CAUSES. BLOCK REEK IS A CHAIN-LIKE SCRATCH PRODUCED IN POLISHING. A RUNNER-CUT IS A CURVED SCRATCH CAUSED BY GRINDING. A SLEEK IS A HARLINE SCRATCH. A CRUSH OR RUB IS A SURFACE SCRATCH OR SERIES OF SMALL SCRATCHES GENERALLY CAUSED BY MISHANDLING, SCUFFING, OR SCRAPING.

SDM
SEE: SPACE DIVISION MULTIPLEX.

SECOND
SEE: LUMEN-SECOND.

SECONDARY SPECTRUM
THE RESIDUAL CHROMATIC ABERRATION, PARTICULARLY THE LONGITUDINAL CHROMATIC ABERRATION OF AN ACHROMATIC LENS. NOTE: UNLIKE THE PRIMARY SPECTRUM, IT CAUSES THE IMAGE FORMED IN ONE PARTICULAR COLOR TO LIE NEAREST THE LENS, THE IMAGES IN ALL OTHER COLORS BEING FORMED BEHIND THE FIRST AT DISTANCES THAT INCREASE SHARPLY TOWARDS BOTH ENDS OF THE USEFUL WAVELENGTH SPECTRUM. SEE ALSO: PRIMARY SPECTRUM.

SECURITY OPTICAL FIBER
SEE: OPTICAL-FIBER TRAP.

SEED
A GASEOUS INCLUSION HAVING AN EXTREMELY SMALL DIAMETER IN GLASS OR OTHER TRANSPARENT MEDIUM. SEE: SCATTERED SEED.

SEEDING

SEE: HEAVY SEEDING.

SELECTIVE ABSORPTION

THE ACT OR PROCESS BY WHICH A SUBSTANCE ABSORBS, I.E. TAKES UP, SOAKS UP ALL THE FREQUENCIES OR COLORS CONTAINED IN A BEAM, OF ELECTROMAGNETIC RADIATION, SUCH AS WHITE LIGHT, EXCEPT THOSE THAT IT REFLECTS OR TRANSMITS. NOTE: SOME SUBSTANCES ARE TRANSPARENT TO WAVES OF CERTAIN FREQUENCIES, ALLOWING THEM TO BE TRANSMITTED, WHILE ABSORBING WAVES OF OTHER FREQUENCIES. SOME REFLECTING SURFACES WILL ABSORB LIGHT OF CERTAIN FREQUENCIES AND REFLECT OTHERS. THE COLOR OF A TRANSPARENT OBJECT IS THE COLOR IT TRANSMITS, AND THE COLOR OF AN OPAQUE OBJECT IS THE COLOR IT REFLECTS.

SEE ALSO: SELECTIVE TRANSMISSION.

SELECTIVE TRANSMISSION

THE ACT OR PROCESS BY WHICH A SUBSTANCE CONDUCTS OR TRANSMITS ALL THE COLORS OR FREQUENCIES OF A BEAM OF WHITE LIGHT, EXCEPT THOSE THAT IT REFLECTS OR ABSORBS. NOTE: SOME SUBSTANCES TRANSMIT ONLY CERTAIN COLORS AND ABSORB OR REFLECT ALL OTHERS. THE COLOR OF A TRANSPARENT OBJECT IS THE COLOR IT TRANSMITS. THE COLOR OF AN OPAQUE OBJECT IS THE COLOR IT REFLECTS. ABSORBED COLORS ARE NOT SEEN. SEE ALSO: SELECTIVE ABSORPTION.

SELECTIVE TRANSMITTANCE

THE PROPERTY OF VARIATION OF TRANSMITTANCE WITH THE WAVELENGTH OF LIGHT TRANSMITTED THROUGH A SUBSTANCE.

SEMICONDUCTOR LASER

A LASER IN WHICH LASING OCCURS AT THE JUNCTION OF N-TYPE AND P-TYPE SEMICONDUCTOR MATERIALS. SYNONYM: DIODE LASER; INJECTION LASER.

SERVICE CONNECTION

SEE: LASER SERVICE CONNECTION.

SHAPED PULSE

SEE: GAUSSIAN-SHAPED PULSE.

SHOT NOISE

1. IN A PHOTODETECTOR, THE NOISE CAUSED BY CURRENT FLUCTUATIONS, DUE TO THE DISCRETE NATURE OF CHARGE CARRIERS, AND RANDOM EMISSION OF CHARGED PARTICLES FROM AN EMITTER. THE MEAN SQUARE SHOT NOISE CURRENT IS EQUAL TO 2QIB, WHERE B IS BANDWIDTH, I IS THE AVERAGE PHOTOCURRENT, AND Q IS THE ELECTRONIC CHARGE OF EACH CHARGED PARTICLE. NOTE: IN THE PHOTODETECTOR, I CONTAINS CONTRIBUTIONS DUE TO THE SIGNAL CURRENT, BACKGROUND-RADIATION-INDUCED PHOTOCURRENT, AND DARK CURRENT. THIS MEAN SQUARE SHOT NOISE CURRENT, (AMP SQUARE) IS CONVERTED TO NOISE POWER (WATTS) IN THE EQUIVALENT RESISTANCE OF THE PHOTODETECTOR AND ITS OUTPUT CIRCUIT. SHOT NOISE CURRENT WOULD REDUCE TO ZERO IF THE MAGNITUDE OF AN INDIVIDUAL CHARGE TENDED TO ZERO. THIS FACT REFLECTS THE UNDERLYING CAUSE OF SHOT NOISE: THE DISCRETE NATURE OF THE CHARGE. IF THERE WERE NO DARK CURRENT AND BACKGROUND RADIATION ON THE DETECTOR, SO THE ONLY CONTRIBUTION TO AVERAGE PHOTOCURRENT WAS DUE TO THE OPTICAL SIGNAL, THE RESULTING SHOT NOISE CURRENT

DENSITY WOULD PRODUCE NOISE WHICH IS THE LOWER LIMIT ON DETECTOR NOISE; THIS LEADS TO QUANTUM-NOISE-LIMITED SENSITIVITY. , THE QUANTUM LIMIT TO OPTICAL SENSITIVITY IS DUE TO THE GRANULARITY, OR PARTICLE NATURE, OF LIGHT. THUS, THE MINIMUM ENERGY INCREMENT OF AN ELECTROMAGNETIC (OPTICAL) WAVE IS HF, I.E. THE ENERGY OF A PHOTON, THE NOISE OF THE PHOTOCURRENT DUE TO THE OPTICAL SIGNAL. THUS, QUANTUM NOISE BECOMES HFB IN THE LIMIT, WHEN PHOTOCURRENT IS DUE ONLY TO THE OPTICAL SIGNAL, WHERE H IS PLANCK'S CONSTANT, F IS THE FREQUENCY, AND B IS THE BANDWIDTH. SYNONYM: QUANTUM NOISE.

SIGNAL-TO-NOISE RATIO
THE RATIO OF THE SIGNAL POWER TO THE NOISE POWER IN A GIVEN SYSTEM.

SILICA CLADDED FIBER
SEE: DOPED-SILICA CLADDED FIBER.

SILICA FIBER
SEE: LOW-LOSS FEP-CLAD SILICA FIBER; PLASTIC-CLAD SILICA FIBER.

SILICA GRADED FIBER
SEE: DOPED-SILICA GRADED FIBER.

SIMPLE MICROSCOPE
SEE: MAGNIFIER.

SINE WAVE OBJECT
AN OBJECT HAVING A SINUSOIDAL VARIATION OF LUMINANCE, HAVING THE ADVANTAGE THAT THE IMAGE WILL HAVE A SINUSOIDAL VARIATION OF ILLUMINANCE AND THE ONLY EFFECT OF DEGENERATION BY A LENS SYSTEM WILL BE TO DECREASE THE MODULATION IN THE IMAGE RELATIVE TO THAT IN THE OBJECT.

SINE WAVE RESPONSE
SEE: MODULATION TRANSFER FUNCTION.

SINGLE-BUNDLE CABLE
SEE: SINGLE-CHANNEL SINGLE-BUNDLE CABLE.

SINGLE-CHANNEL SINGLE-BUNDLE CABLE
A BUNDLE OF OPTICAL FIBERS WITH A PROTECTIVE COVERING.

SINGLE-CHANNEL SINGLE-FIBER CABLE
A SINGLE OPTICAL CONDUCTOR USUALLY WITH A PROTECTIVE COVERING.

SINGLE FIBER
A DISCRETE CONDUCTOR OF LIGHT WAVES. NOTE: THE DISCRETE FILAMENT OF OPTICAL MATERIAL, GLASS OR PLASTIC IS USUALLY MADE WITH A LOWER-INDEX CLADDING.

SINGLE-FIBER CABLE

SEE: MULTI-CHANNEL SINGLE-FIBER CABLE; SINGLE-CHANNEL SINGLE-FIBER CABLE.

SINGLE-FIBER LIGHT GUIDE

SEE: OPTICAL FIBER.

SINGLE HETEROJUNCTION

IN A LASER DIODE, A SINGLE JUNCTION INVOLVING TWO ENERGY LEVEL SHIFTS AND TWO REFRACTIVE INDEX SHIFTS, USED TO PROVIDE INCREASED CONFINEMENT OF RADIATION DIRECTION, IMPROVED CONTROL OF RADIATIVE RECOMBINATION, AND REDUCED NONRADIATIVE (THERMAL) RECOMBINATION. SYNONYM: CLOSE-CONFINEMENT JUNCTION.

SINGLE MODE FIBER

A FIBER WAVEGUIDE THAT SUPPORTS THE PROPAGATION OF ONLY ONE MODE. NOTE: THE SINGLE-MODE FIBER IS USUALLY A LOW-LOSS OPTICAL WAVEGUIDE WITH A VERY SMALL CORE (2-8 MICRONS). IT REQUIRES A LASER SOURCE FOR THE INPUT SIGNALS BECAUSE OF THE VERY SMALL ENTRANCE APERTURE (ACCEPTANCE CONE). THE SMALL CORE RADIUS APPROACHES THE WAVELENGTH OF THE SOURCE; CONSEQUENTLY, ONLY A SINGLE MODE IS PROPAGATED.

SKEW RAY

IN AN OPTICAL FIBER, A LIGHT RAY THAT NEVER INTERSECTS THE AXIS OF THE FIBER WHILE BEING INTERNALLY REFLECTED. NOTE: THE SKEW RAY IS AT AN ANGLE TO THE FIBER AXIS. IF THE FIBER WAVEGUIDE IS STRAIGHT, A SKEW RAY TRAVERSES A HELICAL PATH ALONG THE FIBER, NOT CROSSING THE FIBER AXIS. A SKEW RAY IS NOT CONFINED TO THE MERIDIAN PLANE. THE SKEW RAY IS NOT A MERIDIONAL RAY. SEE ALSO: MERIDIONAL RAY.

SKIM

IN OPTICAL ELEMENTS, STREAKS OF DENSE SEEDS WITH ACCOMPANYING SMALL BUBBLES.

SLAB-DIELECTRIC OPTICAL WAVEGUIDE

AN OPTICAL WAVEGUIDE CONSISTING OF RECTANGULAR LAYERS OF RIBBONS OF MATERIALS OF DIFFERING REFRACTIVE INDICES THAT SUPPORT ONE OR MORE LIGHTWAVE TRANSMISSION MODES, WITH THE ENERGY OF THE TRANSMITTED WAVES CONFINED PRIMARILY TO THE LAYER OF HIGHEST REFRACTIVE INDEX, THE LOWER INDEXED MEDIA SERVING AS CLADDING, JACKETING, OR SURROUNDING MEDIUM. NOTE: SLAB-DIELECTRIC OPTICAL WAVEGUIDES ARE USED IN INTEGRATED OPTICAL CIRCUITS FOR GEOMETRICAL CONVENIENCE, IN CONTRAST TO OPTICAL FIBERS IN CABLES USED FOR LONG-DISTANCE TRANSMISSION.

SLD

SEE: SUPERLUMINESCENT DIODE

SLEEK

IN OPTICAL ELEMENTS, A POLISHING SCRATCH WITHOUT VISIBLE CONCHOIDAL FRACTURING OF THE EDGES.

SLEEVE SPLICER
SEE: PRECISION-SLEEVE SPLICER.

SNELL'S LAW
WHEN ELECTROMAGNETIC WAVES, SUCH AS LIGHT PASS FROM A GIVEN MEDIUM TO A DENSER MEDIUM, ITS PATH IS DEVIATED TOWARD THE NORMAL; WHEN PASSING INTO A LESS DENSE MEDIUM, ITS PATH IS DEVIATED AWAY FROM THE NORMAL. NOTE: SNELLS' LAW, OFTEN CALLED THE LAW OF REFRACTION, DEFINES THIS PHENOMENON BY DESCRIBING THE RELATION BETWEEN THE ANGLE OF INCIDENCE AND THE ANGLE OF REFRACTION AS FOLLOWS, NAMELY SIN I/SIN R = N(R)/N(I), WHERE I IS THE ANGLE OF INCIDENCE, R IS THE ANGLE OF REFRACTION, N(R) IS THE REFRACTIVE INDEX OF THE MEDIUM CONTAINING THE REFRACTED RAY, AND N(I) IS THE REFRACTIVE INDEX CONTAINING THE INCIDENT RAY. STATED IN ANOTHER WAY, BOTH LAWS, THAT OF REFLECTION AND OF REFRACTION, ARE ATTRIBUTED TO SNELL, NAMELY, WHEN THE INCIDENT RAY, THE NORMAL TO THE SURFACE AT THE POINT OF INCIDENCE OF THE RAY ON THE SURFACE, THE REFLECTED RAY, AND THE REFRACTED RAY, ALL LIE IN A SINGLE PLANE. THE ANGLE BETWEEN THE INCIDENT RAY AND THE NORMAL IS EQUAL IN MAGNITUDE TO THE ANGLE BETWEEN THE REFLECTED RAY AND THE NORMAL. THE RATIO OF THE SINE OF THE ANGLE BETWEEN THE NORMAL AND THE INCIDENT RAY TO THE SINE OF THE ANGLE BETWEEN THE NORMAL AND THE REFRACTED RAY IS A CONSTANT. SEE ALSO: REFRACTION.

SNR
SEE: SIGNAL-TO-NOISE RATIO.

SOLID-STATE LASER
A LASER WHOSE ACTIVE MEDIUM IS A SOLID MATERIAL SUCH AS GLASS, CRYSTAL, OR SEMI-CONDUCTOR MATERIAL, RATHER THAN GAS OR LIQUID.

SOOT PROCESS
SEE: CHEMICAL VAPOR-PHASE OXIDATION PROCESS.

SOURCE
SEE: EMITTER; LAMBERTIAN SOURCE; STANDARD SOURCE.
SEE: YAG/LED SOURCE.

SOURCE-COUPLER LOSS
IN AN OPTICAL DATA LINK, OPTICAL COMMUNICATION SYSTEM, OR OPTICAL FIBER SYSTEM, THE LOSS, USUALLY EXPRESSED IN DB, BETWEEN THE LIGHT SOURCE AND THE DEVICE OR MATERIAL THAT COUPLES THE LIGHT SOURCE ENERGY FROM THE SOURCE TO THE FIBER CABLE.

SOURCE-FIBER COUPLING
IN FIBER OPTIC TRANSMISSION SYSTEMS, THE TRANSFER OF OPTICAL SIGNAL POWER EMITTED BY A LIGHT SOURCE INTO AN OPTICAL FIBER, SUCH COUPLING BEING DEPENDENT UPON MANY FACTORS, INCLUDING GEOMETRY AND FIBER CHARACTERISTICS. NOTE: MANY OPTICAL FIBER SOURCES HAVE AN OPTICAL FIBER PIGTAIL FOR CONNECTION BY MEANS OF A SPLICE OR A CONNECTOR TO A TRANSMISSION FIBER.

SOURCE-TO-FIBER LOSS

IN AN OPTICAL FIBER, SIGNAL POWER LOSS CAUSED BY THE DISTANCE OF SEPARATION BETWEEN A SIGNAL SOURCE AND THE CONDUCTING FIBER.

SPACE-COHERENT LIGHT

LIGHT THAT HAS THE PROPERTY THAT OVER A GIVEN AREA, USUALLY AN AREA IN A PLANE PERPENDICULAR TO THE DIRECTION OF PROPAGATION, THE AMPLITUDE, PHASE, AND TIME VARIATION ARE PREDICTABLE AND CORRELATED. NOTE: SPATIAL NON-COHERENCE REFERS TO A RANDOM AND UNPREDICTABLE STATE OF THE PHASE OVER AN AREA NORMAL TO THE DIRECTION OF PROPAGATION. SEE ALSO: COHERENT LIGHT; TIME-COHERENT LIGHT.

SPACE-DIVISION MULTIPLEXING

SEE: OPTICAL SPACE-DIVISION MULTIPLEXING.

SPAR

SEE: ICELAND SPAR.

SPATTER

SMALL CHUNKS OF MATERIAL THAT FLY FROM THE HOT CRUCIBLE ONTO THE GLASS SURFACE, AND ADHERE THERE, IN EVAPORATIVE COATINGS OF OPTICAL ELEMENTS SUCH AS LENSES, PRISMS, AND MIRRORS.

SPECTRAL ABSORPTANCE

THE ABSORPTANCE OF ELECTROMAGNETIC RADIATION BY A MATERIAL EVALUATED AT ONE OR MORE WAVELENGTHS. NOTE: SPECTRAL ABSORPTANCE IS NUMERICALLY THE SAME FOR RADIANT AND LUMINOUS FLUX.

SPECTRAL BANDWIDTH

THE WAVELENGTH INTERVAL IN WHICH A RADIATED SPECTRAL QUANTITY IS A SPECIFIED FRACTION OF ITS MAXIMUM VALUE. NOTE: THE FRACTION IS USUALLY TAKEN AS 0.50 OF THE MAXIMUM POWER LEVEL, OR 0.707 OF THE MAXIMUM (3 DB) CURRENT TO VOLTAGE LEVEL. IF THE ELECTROMAGNETIC RADIATION IS LIGHT, IT IS THE RADIANT INTENSITY HALF-POWER POINTS THAT ARE USED.

SPECTRAL DENSITY

THE POWER DENSITY OF ELECTROMAGNETIC RADIATION CONSISTING OF A CONTINUOUS SPECTRUM OF FREQUENCIES, EXPRESSED IN WATTS PER HERTZ, TAKEN OVER A FINITE BANDWIDTH.

SPECTRAL EMITTANCE

THE RADIANT EMITTANCE PLOTTED AS A FUNCTION OF WAVELENGTH.

SPECTRAL IRRADIANCE

THE IRRADIANCE PER UNIT WAVELENGTH INTERVALS, NORMALLY MEASURED IN UNITS OF (WATTS PER SQUARE METER) PER MICROMETER (MICRON) OF WAVELENGTH.

SPECTRAL ORDER

SEE: DIFFRACTION GRATING SPECTRAL ORDER.

SPECTRAL RADIANCE
RADIANCE PER UNIT WAVELENGTH INTERVAL, USUALLY MEASURED IN (WATTS PER STERADIAN)/(METER SQUARE) PER MICROMETER (MICRON) OF WAVELENGTH.

SPECTRAL REFLECTIVITY
THE REFLECTIVITY OF A SURFACE EVALUATED AS A FUNCTION OF WAVELENGTH.

SPECTRAL TRANSMITTANCE
TRANSMITTANCE EVALUATED AT ONE OR MORE WAVELENGTHS, BEING NUMERICALLY THE SAME FOR RADIANT AND LUMINOUS FLUX.

SPECTROMETER
A SPECTROSCOPE PROVIDED WITH AN ANGLE SCALE CAPABLE OF MEASURING THE ANGULAR DEVIATION OF RADIATION OF DIFFERENT WAVELENGTHS. NOTE: IN COMMON USAGE, THE DISPERSING MEANS MAY BE DISPENSED WITH, AND THE INSTRUMENT USED FOR MEASURING ANGLES AS ON OR THROUGH A PRISM.

SPECTROSCOPE
AN INSTRUMENT CAPABLE OF DISPERSING RADIATION INTO ITS COMPONENT WAVELENGTHS AND OBSERVING, OR MEASURING, THE RESULTANT SPECTRUM.

SPECTRUM
SEE: ELECTROMAGNETIC SPECTRUM; VISIBLE SPECTRUM; VISUAL SPECTRUM.
SEE: PRIMARY SPECTRUM; SECONDARY SPECTRUM.

SPEED
SEE: LENS SPEED.

SPHERICAL INTENSITY
SEE: MEAN SPHERICAL INTENSITY.

SPHEROMETER
AN INSTRUMENT FOR THE PRECISE MEASUREMENT OF THE RADIUS OF CURVATURE OF SURFACES.

SPLICE
SEE: FIBER-OPTIC SPLICE.

SPLICER
SEE: LOOSE-TUBE SPLICER; PRECISION-SLEEVE SPLICER.

SPLICING
SEE: FUSION SPLICING.

SPONTANEOUS EMISSION
IN A LASER, THE EMISSION OF LIGHT THAT DOES NOT BEAR AN AMPLITUDE, PHASE, OR TIME RELATIONSHIP WITH AN APPLIED SIGNAL AND IS THEREFORE A RANDOM NOISE-LIKE FORM OF RADIATION.

SPREAD
SEE: MULTIMODE GROUP-DELAY SPREAD.

SPREADING
SEE: PULSE DISPERSION.

STANDARD SOURCE
A REFERENCE OPTICAL POWER SOURCE TO WHICH EMITTING AND DETECTING DEVICES MAY BE COMPARED FOR CALIBRATION PURPOSES.

STAR
SEE: D-STAR.

STAR COUPLER
SEE: NON-REFLECTIVE STAR COUPLER; REFLECTIVE STAR-COUPLER.

STARK EFFECT
THE SPLITTING OF SPECTRAL LINES OF ELECTROMAGNETIC RADIATION BY AN APPLIED ELECTRIC FIELD.

STATE
SEE: EXCITED STATE; GROUND STATE.

STEP-INDEX FIBER
A FIBER IN WHICH THERE IS AN ABRUPT CHANGE IN REFRACTIVE INDEX BETWEEN THE CORE AND CLADDING ALONG A FIBER DIAMETER, WITH THE CORE REFRACTIVE INDEX HIGHER THAN THE CLADDING REFRACTIVE INDEX. NOTE: THESE MAY BE MORE THAN ONE LAYER, EACH LAYER WITH A DIFFERENT REFRACTIVE INDEX THAT IS UNIFORM THROUGHOUT THE LAYER, WITH DECREASING INDICES IN THE OUTSIDE LAYER.

STEP-INDEX PROFILE
THE CONDITION OF HAVING THE REFRACTIVE INDEX OF A MATERIAL, SUCH AS AN OPTICAL FIBER, CHANGE ABRUPTLY FROM ONE VALUE TO ANOTHER AT THE CORE-CLADDING INTERFACE, OR AT OTHER INTERFACES IF SEVERAL LAYERS ARE PRESENT.

STEPWISE VARIABLE OPTICAL ATTENUATOR
A DEVICE THAT ATTENUATES THE INTENSITY OF LIGHTWAVES, WHEN INSERTED INTO AN OPTICAL WAVEGUIDE LINK IN DISCRETE STEPS EACH OF WHICH IS SELECTABLE BY SOME MEANS, SUCH AS BY CHANGING SETS OF CELLS. FOR EXAMPLE IF FIXED ATTENUATION CELLS OF 0, 3, 7, 17 DB ARE USED THREE AT A TIME, ATTENUATIONS OF 3, 6, 10, 13, 20, 23, AND 27 DB ATTENUATIONS ARE ACHIEVABLE.

STERADIAN

THE UNIT SOLID ANGULAR MEASURE, BEING THE SUBTENDED SURFACE AREA OF A SPHERE DIVIDED BY THE SQUARE OF THE SPHERE RADIUS. THERE ARE 4 PI STERADIANS IN A SPHERE. THE SOLID ANGLE SUBTENDED BY A CONE OF HALF-ANGLE A IS 2 PI (1-COS A) STERADIANS.

STIMULATED EMISSION

IN A LASER, THE EMISSION OF LIGHT CAUSED BY A SIGNAL APPLIED TO THE LASER SUCH THAT THE RESPONSE IS DIRECTLY PROPORTIONAL TO, AND IN PHASE COHERENCE WITH, THE ELECTROMAGNETIC FIELD OF THE STIMULATING SIGNAL. NOTE: THIS COHERENCY BETWEEN APPLIED SIGNAL AND RESPONSE IS THE KEY TO THE USEFULNESS OF THE LASER. SEE ALSO: SPONTANEOUS EMISSION.

STIMULATED EMISSION OF RADIATION

SEE: MICROWAVE AMPLIFICATION BY STIMULATED EMISSION OF RADIATION.

STOP

SEE: APERTURE STOP.
SEE: T-STOP.

STRENGTH-MEMBER OPTICAL CABLE

SEE: CENTRAL STRENGTH-MEMBER OPTICAL CABLE; PERIPHERAL STRENGTH-MEMBER OPTICAL CABLE.

STRIA

A DEFECT IN OPTICAL MATERIALS, SUCH AS GLASS, PLASTIC, OR CRYSTALS, CONSISTING OF A MORE OR LESS SHARPLY DEFINED STREAK OF MATERIAL HAVING A SLIGHTLY DIFFERENT INDEX OF REFRACTION THAN THE MAIN BODY OF THE MATERIAL. NOTE: STRIAE USUALLY CAUSE WAVE-LIKE DISTORTIONS IN OBJECTS SEEN THROUGH THE MATERIAL, EXCLUSIVE OF SIMILAR DISTORTIONS DUE TO VARIATIONS IN THICKNESS OR CURVATURE. STRIAE ARE USUALLY CAUSED BY TEMPERATURE VARIATION, OR POOR MIXING OF INGREDIENTS, CAUSING THE DENSITY (REFRACTIVE INDEX) TO VARY IN DIFFERENT PLACES.

STRIP-LOADED DIFFUSED OPTICAL WAVEGUIDE

A THREE-DIMENSIONAL OPTICAL WAVEGUIDE, CONSTUCTED FROM A TWO-DIMENSIONAL DIFFUSED OPTICAL WAVEGUIDE UPON THE SURFACE OF WHICH HAS BEEN DEPOSITED A DIELECTRIC STRIP OF A LOWER REFRACTIVE INDEX MATERIAL, THUS CONFINING THE ELECTROMAGNETIC FIELDS OF THE PROPAGATING MODE TO THE VICINITY OF THE STRIP HENCE ACHIEVING A THREE-DIMENSIONAL GUIDE.

STRIPPER

SEE: CLADDING-MODE STRIPPER.

STUFFING PROCESS

SEE: MOLECULAR STUFFING PROCESS (MS).

SUPERLUMINESCENT DIODE (SLD)

A LIGHT-EMITTING DIODE (LED) WITH NARROW SPECTRAL WIDTH AND HIGH-RADIANCE AND STIMULATED EMISSION. NOTE: THE SLD SERVES AS A SOURCE FOR OPTICAL FIBER TRANSMISSION SYSTEMS.

SURFACE
SEE: OPTICAL SURFACE.

SURFACE-EMITTING LED
A LIGHT-EMITTING DIODE WITH A SPECTRAL OUTPUT THAT EMANATES FROM THE SURFACE OF THE LAYERS, HAVING A LOWER OUTPUT INTENSITY AND LOWER COUPLING EFFICIENCY TO AN OPTICAL FIBER OR INTEGRATED OPTICAL CIRCUIT, THAN THE EDGE-EMITTING LED AND THE INJECTION LASER. NOTE: SURFACE-AND EDGE-EMITTING LEDS PROVIDE SEVERAL MILLIWATTS OF POWER IN THE 0.8-1.2 MICRON SPECTRAL RANGE AT DRIVE CURRENTS OF 100-200 MILLIAMPERES; DIODE LASERS AT THESE CURRENTS PROVIDE TENS OF MILLIWATTS. SYNONYMS: FRONT-EMITTING LED; BURRUS LED. SEE ALSO: EDGE-EMITTING LED.

SURFACE MIRROR
SEE: BACK-SURFACE MIRROR; FRONT-SURFACE MIRROR.

SURFACE WAVE
AN ELECTROMAGNETIC WAVE THAT PROPAGATES ALONG AN INTERFACE BETWEEN TWO DIFFERENT MEDIA WITHOUT RADIATION, SUCH AS IS OBTAINED IN AN OPTICAL FIBER, I.E. THERE IS NO ENERGY CONVERTED FROM THE SURFACE WAVE FIELD TO SOME OTHER FORM.

SWITCH
SEE: OPTICAL SWITCH; THIN-FILM OPTICAL SWITCH.
SEE: Q-SWITCH.

SWITCH-MODULATOR
SEE: INTEGRATED-OPTICAL CIRCUIT FILTER-COUPLER-SWITCH-MODULATOR.

SWITCHED REPETITIVELY-PULSED LASER
SEE: Q-SWITCHED REPETITIVELY-PULSED LASER.

SYMMETRICAL DOUBLE-HETEROJUNCTION DIODE
SEE: FOUR-HETEROJUNCTION DIODE.

SYSTEM
SEE: FIBER-OPTIC TRANSMISSION SYSTEM; LASER FIBER-OPTIC TRASMISSION SYSTEM; LASER FIBER-OPTIC TRANSMISSION SYSTEM; LENS SYSTEM.

TALBOT

IN THE METER-KILOGRAM-SECOND SYSTEM OF UNITS, A UNIT OF LUMINOUS ENERGY EQUAL TO TEN MILLION LUMERGS AND ALSO EQUAL TO ONE LUMEN-SECOND.

TALK

SEE: CROSS TALK.

TANGENTIAL COUPLING

THE COUPLING OF ONE OPTICAL FIBER TO ANOTHER BY PLACING OR FUSING THE CORE OF THE FIBER CONTAINING A SIGNAL IN CLOSE PROXIMITY FOR A SHORT DISTANCE TO ANOTHER FIBER CORE, TO ALLOW SOME OF THE SIGNAL TO LEAK OR SPILL OVER TO THE ATTACHED FIBER, BY SUBVERTING THE ORIGINAL SIGNAL-BEARING FIBER FROM KEEPING ALL ITS LIGHT TO ITSELF. NOTE: THE DEGREE OF COUPLING IS DETERMINED BY THE CORE-TO-CORE SPACING AND THE FUSED LENGTH. THIS METHOD OF COUPLING ALSO MAKES USE OF THE EVANESCENT WAVES THAT ARE COUPLED TO THE WAVES IN THE GUIDE BUT ARE TRAVELLING ON THE OUTSIDE OF THE OPTICAL WAVEGUIDE. SYNONYM: PICK-OFF COUPLING. SEE ALSO: EVANESCENT FIELD COUPLING; LOOSE-TUBE SPLICER.

TAPER

SEE: OPTICAL TAPER.

TAPERED LENS

A LENS WHOSE CROSS SECTION SHOWS A GREATER EDGE THICKNESS ON ONE SIDE THAN ON THE OTHER.

TDM

SEE: TIME DIVISION MULTIPLEX.

TEA LASER

SEE: TRANSVERSE-ELECTRIC ATMOSPHERE LASER.

TECHNIQUE

SEE: COHERENT OPTICAL ADAPTIVE TECHNIQUE.

TEE COUPLER

IN AN OPTICAL FIBER, A REFLECTIVE SURFACE PLACED INSIDE THE FIBER, AT FORTY-FIVE DEGREES TO THE DIRECTION OF WAVE PROPAGATION, ALLOWING A PART OF THE SIGNAL POWER TO BE REFLECTED FROM ONE SIDE OF THE SURFACE OUT OF THE FIBER AT RIGHT ANGLES IN ONE DIRECTION, AND AN INPUT SIGNAL FROM THE OTHER SIDE OF THE FIBER TO BE REFLECTED FROM THE OTHER SIDE OF THE FORTY-FIVE DEGREE REFLECTIVE SURFACE SO AS TO PROPAGATE IN THE FIBER, LONGITUDINALLY, IN THE SAME DIRECTION AS THE ORIGINAL SIGNAL TO WHICH THE INPUT SIGNAL IS BEING ADDED AND THE OUTPUT SIGNAL IS BEING TAKEN. NOTE: TWO T-COUPLERS CAN BE COMBINED IN A SINGLE UNIT FOR INPUT AND OUTPUT OF SIGNALS IN BOTH

DIRECTIONS OF PROPAGATION. IN ADDITION TO AN OPTICAL COMPONENT USED TO INTERCONNECT A NUMBER OF TERMINALS THROUGH OPTICAL WAVEGUIDES BY USING PARTIAL REFLECTIONS AT DIELECTRIC INTERFACES OR METALLIC SURFACES. COUPLING CAN BE ACCOMPLISHED SIMPLY BY SPLITTING THE WAVEGUIDE BUNDLE SO THAT FRACTIONS CAN DIVERGE IN DIFFERENT DIRECTIONS. SEE ALSO: REFLECTIVE STAR-NON-REFLECTIVE STAR-COUPLER.

TELEPHOTO LENS

AN OBJECTIVE LENS SYSTEM CONSISTING OF A POSITIVE AND A NEGATIVE COMPONENT SEPARATED FROM EACH OTHER, HAVING SUCH POWERS AND SEPARATION THAT THE BACK FOCAL LENGTH OF THE ENTIRE SYSTEM IS SMALL IN COMPARISON WITH THE EQUIVALENT FOCAL LENGTH. NOTE: SUCH LENSES ARE USED FOR PRODUCING LARGE IMAGES OF DISTANT OBJECTS WITHOUT THE NECESSITY OF A CUMBERSOME LENGTH OF THE INSTRUMENT.

TEMPERATURE

SEE: COLOR TEMPERATURE.
SEE: LUMINANCE TEMPERATURE; TOTAL RADIATION TEMPERATURE.

TEMPORALLY-COHERENT LIGHT

SEE: TIME-COHERENT LIGHT.

TERAHERTZ

10 (12) HERTZ. NOTE: LIGHT FREQUENCIES ARE OF THE ORDER OF 10 (15) HERTZ, FOR A WAVELENGTH OF 300 MILLIMICRONS IN A VACUUM, IN THE REGION OF ULTRAVIOLET LIGHT.

TERM

SEE: ATTENUATION TERM; PHASE TERM.

TERMINUS

SEE: FIBER-OPTIC TERMINUS

TEST

SEE: FOUCAULT KNIFE-EDGE TEST

THEORETICAL RESOLVING POWER

THE MAXIMUM POSSIBLE RESOLVING POWER DETERMINED BY DIFRACTION. FREQUENTLY MEASURED AS AN ANGULAR RESOLUTION DETERMINED FROM A=1.22 B/D, WHERE A IS THE LIMITING RESOLUTION IN RADIANS, B IS THE WAVE LENGTH OF LIGHT AT WHICH THE RESOLUTION IS DETERMINED, AND D IS THE DIAMETER OF THE EFFECTIVE APERTURE.

THEORY

SEE: ELECTROMAGNETIC THEORY.

THERMAL NOISE-LIMITED OPERATION

THE OPERATION OF A PHOTODETECTOR WHEREIN THE MINIMUM DETECTABLE

SIGNAL IS LIMITED BY THE THERMAL NOISE OF THE DETECTOR, THE LOAD RESISTANCE, AND THE AMPLIFIER NOISE.

THERMAL RADIATION
THE PROCESS OF ELECTROMAGNETIC EMISSION IN WHICH THE RADIATED ENERGY IS EXTRACTED FROM THE THERMAL EXCITATION OF ATOMS OR MOLECULES.

THERMOPLASTIC CEMENT
AN ADHESIVE WHOSE VISCOSITY DECREASES AS THE TEMPERATURE IS RAISED. NOTE: CANADA BALSAM, RESIN, AND PITCH ARE COMMON THERMOPLASTIC OPTICAL CEMENTS.

THERMOSETTING CEMENT
AN ADHESIVE THAT PERMANENTLY SETS OR HARDENS AT A CERTAIN HIGH TEMPERATURE. NOTE: METHACRYLATE IS A COMMON THERMOSETTING OPTICAL CEMENT.

THICK LENS
A LENS WHOSE AXIAL THICKNESS IS SO LARGE THAT THE PRINCIPAL POINTS AND THE OPTICAL CENTER CANNOT BE CONSIDERED AS CONCIDING AT A SINGLE POINT ON ITS OPTICAL AXIS.

THIN-FILM OPTICAL MODULATOR
A DEVICE MADE OF MULTILAYERED FILMS OF MATERIAL OF DIFFERENT OPTICAL CHARACTERISTICS CAPABLE OF MODULATING TRANSMITTED LIGHT BY USING ELECTROOPTIC, ELECTROACOUSTIC, OR MAGNETOOPTIC EFFECTS TO OBTAIN SIGNAL MODULATION. NOTE: THIN-FILM OPTICAL MODULATORS ARE USED AS COMPONENT PARTS OF INTEGRATED OPTICAL CIRCUITS.

THIN-FILM OPTICAL MULTIPLEXER
A MULTIPLEXER CONSISTING OF LAYERED OPTICAL MATERIALS THAT MAKE USE OF ELECTROOPTIC, ELECTROACOUSTIC, OR MAGNETOOPTIC EFFECTS TO ACCOMPLISH THE MULTIPLEXING. NOTE: THIN-FILM OPTICAL MULTIPLEXERS MAY BE COMPONENT PARTS OF INTEGRATED OPTICAL CIRCUITS.

THIN-FILM OPTICAL SWITCH
A SWITCHING DEVICE FOR PERFORMING LOGIC OPERATIONS USING LIGHT WAVES IN THIN FILMS, USUALLY SUPPORTING ONLY ONE PROPAGATION MODE, MAKING USE OF ELECTROOPTIC, ELECTROACOUSTIC, OR MAGNETOOPTIC EFFECTS TO PERFORM SWITCHING FUNCTIONS, SUCH AS ARE PERFORMED BY SEMICONDUCTOR GATES (AND, OR, NEGATION). NOTE: THIN-FILM OPTICAL SWITCHES MAY BE COMPONENT PARTS OF INTEGRATED OPTICAL CIRCUITS.

THIN-FILM OPTICAL WAVEGUIDE
AN OPTICAL WAVEGUIDE CONSISTING OF THIN LAYERS OF DIFFERING REFRACTIVE INDICES, THE LOWER INDEXED MATERIAL ON THE OUTSIDE OR AS A SUBSTRATE, FOR SUPPORTING USUALLY A SINGLE ELECTROMAGNETIC WAVE PROPAGATION MODE WITH LASER SOURCES. NOTE: THE THIN-FILM WAVEGUIDE LASERS, MODULATORS, SWITCHES, DIRECTIONAL COUPLERS, FILTERS, AND RELATED COMPONENTS NEED TO BE COUPLED FROM THEIR INTEGRATED OPTICAL CIRCUITS TO THE OPTICAL WAVEGUIDE TRANSMISSION MEDIA, SUCH AS OPTICAL FIBERS AND SLAB DIELECTRIC WAVEGUIDES.

THIN LENS

A LENS WHOSE AXIAL THICKNESS IS SUFFICIENTLY SMALL SO THAT THE PRINCIPAL POINTS, THE OPTICAL CENTER, AND THE VERTICES OF ITS TWO SURFACES CAN BE CONSIDERED AS COINCIDING AT THE SAME POINT ON ITS OPTICAL AXIS.

THRESHOLD

SEE: ABSOLUTE LUMINANCE THRESHOLD.

TIME-COHERENT LIGHT

LIGHT THAT HAS THE PROPERTY THAT AT ANY POINT IN TIME, I.E. ANY INSTANT, THE AMPLITUDE, PHASE, AND TIME VARIATION ARE PREDICTABLE, THE PREDICTION BEING BASED ON THE AMPLITUDE, PHASE, AND TIME VARIATION AT A PREVIOUS TIME. SYNONYM: TEMPORALLY-COHERENT LIGHT. SEE ALSO: COHERENT-LIGHT; SPACE-COHERENT LIGHT.

T-NUMBER

THE EQUIVALENT F-NUMBER OF A FICTITIOUS LENS THAT HAS A CIRCULAR OPENING AND 100 PERCENT TRANSMITTANCE, AND THAT GIVES THE SAME CENTRAL ILLUMINATION AS THE ACTUAL LENS UNDER CONSIDERATION. MATHEMATICALLY, T-NUMBER = E.F.L/DIAM-OF-T-STOP, OR T NUMBER = (E.F.L/2) (PI/AT)-TO-THE 1/2-POWER, WHERE E.F.L. IS THE EQUIVALENT FOCAL LENGTH, A IS THE AREA OF THE ENTRANCE PUPIL, T IS THE TRANSMITTANCE OF THE LENS SYSTEM, AND PI = 3.1416.

TOTAL DIFFUSE REFLECTANCE

SEE: DIFFUSE REFLECTANCE.

TOTAL INTERNAL REFLECTION

THE REFLECTION THAT OCCURS WITHIN A SUBSTANCE BECAUSE THE ANGLE OF INCIDENCE OF LIGHT STRIKING THE BOUNDARY SURFACE IS IN EXCESS OF THE CRITICAL ANGLE. SEE ALSO: CRITICAL ANGLE.

TOTAL INTERNAL REFLECTION ANGLE

SEE: CRITICAL ANGLE.

TOTAL RADIATION TEMPERATURE

THE TEMPERATURE AT WHICH A BLACKBODY RADIATES A TOTAL AMOUNT OF ELECTROMAGNETIC RADIATION FLUX EQUAL TO THAT RADIATED BY THE BODY WHOSE TOTAL RADIATION TEMPERATURE IS BEING CONSIDERED.

TRANSFER FUNCTION

SEE: MODULATION TRANSFER FUNCTION.
SEE: OPTICAL FIBER TRANSFER FUNCTION.

TRANSIMPEDANCE

SEE: OPTICAL TRANSIMPEDANCE.

TRANSITION FREQUENCY

THE FREQUENCY ASSOCIATED WITH TWO DISCRETE ENERGY LEVELS IN AN ATOMIC SYSTEM. NOTE: THE TRANSITION FREQUENCY ASSOCIATED WITH ENERGY LEVELS E(2) AND E(1). E(2) GREATER THAN E(1). IS F(2,1) = (E(2)-E(1))/H. WHERE E(2) AND E(1) ARE THE ENERGY LEVELS. H IS PLANCK'S CONSTANT. AND F(2,1) IS THE FREQUENCY ASSOCIATED WITH THE TWO LEVELS. IF A TRANSITION FROM E(2) TO E(1) OCCURS. A PHOTON WITH FREQUENCY F(2,1) IS LIKELY TO BE EMITTED.

TRANSMISSION
THE PROCESS OF CONDUCTION OF RADIANT ENERGY THROUGH A MEDIUM. SEE: SELECTIVE TRANSMISSION.

TRANSMISSION COEFFICIENT
THE RATIO OF THE TRANSMITTED FIELD STRENGTH TO THE INCIDENT FIELD STRENGTH WHEN AN ELECTROMAGNETIC WAVE IS INCIDENT UPON AN INTERFACE SURFACE BETWEEN DIELECTRIC MEDIA OF DIFFERENT INDICES OF REFRACTION. NOTE: IF. AT OBLIQUE INCIDENCE. THE ELECTRIC FIELD COMPONENT OF THE INCIDENT WAVE IS PARALLEL TO THE INTERFACE. THE TRANSMISSION COEFFICIENT IS GIVEN BY: T = 2N(2) COS A/(N(2)COS A + N(1)COS B); WHERE N(1) AND N(2) ARE THE INDICES OF REFRACTION OF THE INCIDENT AND TRANSMITTED MEDIUM. RESPECTIVELY. AND A AND B ARE THE ANGLES OF INCIDENCE AND REFRACTION (WITH RESPECT TO NORMAL). RESPECTIVELY. IF. AT OBLIQUE INCIDENCE. THE MAGNETIC FIELD COMPONENT OF THE INCIDENT WAVE IS PARALLEL TO THE INTERFACE. THE TRANSMISSION COEFFICIENT IS GIVEN BY: T = 2N(2)COS A/(N(1) COS A + N(2) COS B) THESE EQUATIONS ARE KNOWN AS THE FRESNEL EQUATIONS FOR THESE CASES. SEE ALSO: FRESNEL REFLECTION LOSS; REFLECTION COEFFICIENT.

TRANSMISSION FACTOR
SEE: INTERNAL OPTICAL DENSITY.

TRANSMISSION SYSTEM
SEE: FIBER-OPTIC TRANSMISSION SYSTEM; LASER FIBER-OPTIC TRANSMISSION SYSTEM; LASER FIBER-OPTIC TRANSMISSION SYSTEM.

TRANSMISSIVITY
THE INTERNAL TRANSMITTANCE PER UNIT THICKNESS OF A NONDIFFUSING SUBSTANCE. SUCH AS CLEAR GLASS. PLASTIC. OR CRYSTAL.

TRANSMITTANCE
THE RATIO OF THE FLUX THAT IS TRANSMITTED THROUGH AN OBJECT. TO THE INCIDENT RADIANT OR LUMINOUS FLUX. NOTE: UNLESS QUALIFIED. THE TERM IS APPLIED TO REGULAR. I.E. SPECULAR. TRANSMISSION. SEE: COLLIMATED TRANSMITTANCE; DIFFUSE TRANSMITTANCE; INTERNAL TRANSMITTANCE; LUMINOUS TRANSMITTANCE; RADIANT TRANSMITTANCE; SELECTIVE TRANSMITTANCE; SPECTRAL TRANSMITTANCE.

TRANSMITTANCY
THE RATIO OF THE TRANSMITTANCE OF A SOLUTION TO THAT OF AN EQUAL THICKNESS OF THE SOLVENT ALONE.

TRANSMITTER

SEE: OPTICAL TRANSMITTER.

TRANSMITTING ELEMENT
THE RADIATING TERMINUS AT AN OPTICAL JUNCTION.

TRANSVERSE-EXCITED ATMOSPHERE LASER (TEA)
A CARBON-DIOXIDE OR OTHER GAS LASER IN WHICH THE ELECTRIC FIELD EXCITATION OF THE ACTIVE MEDIUM IS TRANSVERSE (ACROSS) TO THE FLOW OF THE ACTIVE MEDIUM. NOTE: THIS TYPE OF LASER OPERATES IN A GAS PRESSURE RANGE HIGHER THAN THAT REQUIRED FOR LONGITUDINAL EXCITATION.

TRAP
SEE: OPTICAL FIBER TRAP.

TRIPLE MIRROR
THREE REFLECTING SURFACES, MUTUALLY AT RIGHT ANGLES TO EACH OTHER, ARRANGED LIKE THE INSIDE CORNER OF A CUBE. NOTE: THE TRIPLE MIRROR MAY BE CONSTRUCTED OF SOLID GLASS IN WHICH CASE THE TRANSMITTING FACE IS NORMAL TO THE DIAGONAL OF THE CUBE, OR IT MAY CONSIST OF THE THREE PLANE MIRRORS SUPPORTED IN A PRECISELY CONSTRUCTED METAL FRAMEWORK. THE TRIPLE REFLECTOR HAS A CONSTANT DEVIATION OF 180 DEGREES FOR ALL ANGLES OF INCIDENCE. HENCE A RAY OF LIGHT INCIDENT FROM ANY ANGLE IS REFLECTED BACK PARALLEL TO ITSELF. SYNONYM: CORNER-CUBE REFLECTOR; CORNER REFLECTOR; RETRODIRECTIVE REFLECTOR.

TRUE FIELD
SEE: VIEW FIELD.

T-STOP
THE EQUIVALENT, PERFECTLY TRANSMITTING, CIRCULAR OPENING OF DIAMETER D SUCH THAT PI (D/2)-SQUARED = TA WHERE A IS THE AREA OF THE ENTRANCE PUPIL OF THE OBJECTIVE, T IS THE TRANSMITTANCE OF THE LENS SYSTEM, AND PI = 3.1416.

TUBE PHOTOMETER
SEE: PHOTOEMISSIVE TUBE PHOTOMETER.

TUBE SPLICER
SEE: LOOSE-TUBE SPLICER.

TUNABLE LASER
AN ORGANIC DYE OR PARAMETRIC-OSCILLATOR LASER WHOSE EMISSION CAN BE VARIED CONTINUOUSLY ACROSS A BROAD SPECTRAL RANGE. NOTE: SOMETIMES APPLIED TO CARBON-DIOXIDE OR OTHER MOLECULAR LASERS WHOSE EMISSION CAN BE TUNED TO ONE OF SEVERAL WAVELENGTHS (SPECTRAL LINES).

TWYMAN-GREEN INTERFEROMETER
A TESTING DEVICE IN WHICH THE OBSERVER SEES A CONTOUR MAP OF THE EMERGENT WAVEFRONT IN TERMS OF THE WAVELENGTH OF THE LIGHT USED IN THE TASK.

U

ULTRAVIOLET FIBER OPTICS

FIBER OPTICS INVOLVING THE USE OF ULTRAVIOLET (UV) LIGHT-CONDUCTING COMPONENTS DESIGNED TO TRANSMIT ELECTROMAGNETIC WAVES SHORTER IN WAVELENGTH THAN THE WAVES IN THE VISIBLE REGION OF THE SPECTRUM. NOTE: PRIMARY APPLICATIONS INCLUDE MEDICAL TECHNOLOGY, MEDICINE, PHYSICS, MATERIALS TESTING, PHOTOCHEMISTRY, GENETICS, AND MANY OTHER FIELDS. OPTICAL FIBERS WITH HIGH UV TRANSMITTANCE HAVE BEEN DEVELOPED AND ARE BEING USED.

ULTRAVIOLET LIGHT

RAYS OF ELECTROMAGNETIC RADIANT ENERGY IMMEDIATELY BEYOND THE VIOLET END OF THE VISIBLE SPECTRUM AND IN OF THE ORDER OF 390 TO 100 MILLIMCRONS IN WAVELENGTH.

ULTRAVIOLET LIGHT GUIDE

SPECIAL OPTICAL MATERIALS IN VARIOUS GEOMETRIC SHAPES, SUCH AS TUBES, CYLINDERS, SHEETS, AND FIBERS THAT HAVE THE SPECIAL CAPABILITY OF TRANSMITTING LIGHT IN THE ULTRAVIOLET (UV) REGION OF THE SPECTRUM, I.E. WITH A WAVELENGTH OF THE ORDER OF 200 TO 300 MILLIMICRONS WHICH IS LESS THAN THE WAVELENGTH OF THE VISIBLE SPECTRUM, USED IN FIBER OPTICS, ABOUT 0.9 TO 1.0 MICRONS. NOTE: UV LIGHT GUIDES ARE PRIMARILY USED IN MEDICINE, BIOCHEMISTRY, MICROSCOPY, PHYSIOLOGY, AND MEDICAL ENGINEERING.

UNIFORM DENSITY LENS

A LAYERED LENS OR BLANK, ONE LAYER OF WHICH IS CLEAR, AND THE OTHER OF ABSORPTIVE-TYPE GLASS, THE CLEAR PORTION BEING SURFACED TO THE DESIRED CURVATURE, WHILE THE THICKNESS OF THE TINTED LAYER REMAINING CONSTANT, WHICH RESULTS IN A LENS WITH THE SAME SHADE, I.E. TRANSMITTANCE, IN THE CENTER AS IN THE PERIPHERY.

UNIFORM-INDEX PROFILE

IN MATERIALS USED FOR OPTICAL TRANSMISSION, SUCH AS AN OPTICAL FIBER, A UNIFORM LINEARLY DECREASING INDEX OF REFRACTION FROM THE INSIDE RADIALLY TOWARD THE OUTSIDE.

UNIFORM-INDEX-PROFILE FIBER

A GRADED INDEX OPTICAL FIBER IN WHICH THE REFRACTIVE INDEX VARIES LINEARLY FROM THE CENTER OF THE FIBER RADIALLY TO THE OUTSIDE SURFACE, WITH A LOWER INDEX AT THE OUTSIDE SURFACE. SEE ALSO: GRADED INDEX FIBER.

UNIFORM LAMBERTIAN

A LAMBERTIAN DISTRIBUTION THAT IS UNIFORM ACROSS A SPECIFIED SURFACE.

V

VALENCE BAND

THE BAND OF ATOMIC ENERGY LEVELS CONTAINING THE VALENCE ELECTRONS. I.E. THOSE ELECTRONS IN THE OUTER SHELL OF AN ATOM. IN AN INSULATING OR SEMICONDUCTOR MATERIAL, THE VALENCE BAND ENERGY LEVEL IS BELOW THE CONDUCTION BAND. IN A CONDUCTING MATERIAL, FOR EXAMPLE COPPER, ALUMINUM, SILVER, GOLD, AND LEAD, THE VALENCE BAND ENERGY LEVEL IS ABOVE THE CONDUCTION BAND, I.E. THE CONDUCTION BAND IS LOWER, THUS ALLOWING THE ELECTRONS TO BE MORE FREE TO MOVE AS AN ELECTRIC CURRENT.

VAPOR DEPOSITION PROCESS

SEE: MODIFIED CHEMICAL VAPOR-DEPOSITION PROCESS; PLASMA-ACTIVATED CHEMICAL-VAPOR DEPOSITION PROCESS.

VAPOR-PHASE OXIDATION PROCESS

SEE: AXIAL VAPOR PHASE OXIDATION PROCESS; CHEMICAL VAPOR-PHASE OXIDATION PROCESS; INSIDE VAPOR-PHASE OXIDATION PROCESS; MODIFIED INSIDE VAPOR-PHASE OXIDATION PROCESS; OUTSIDE VAPOR-PHASE OXIDATION PROCESS.

VARIABLE OPTICAL ATTENUATOR

SEE: CONTINUOUS VARIABLE OPTICAL ATTENUATOR; STEPWISE VARIABLE OPTICAL ATTENUATOR.

VECTOR

SEE: ELECTRIC VECTOR.

VEE VALUE

SEE: ABBE CONSTANT.

VELOCITY OF LIGHT

THIS TERM USUALLY REFERS TO THE SPEED OF MONOCHROMATIC LIGHT WAVES. I.E. TO THE PHASE VELOCITY. NOTE: THE VELOCITY OF LIGHT IN A VACUUM IS 299. 792.5 KILOMETERS PER SECOND. THE PHASE VELOCITY IN A MEDIUM IS C(O)/N WHERE N IS THE REFRACTIVE INDEX OF THE MEDIUM AND C(O) IS THE VELOCITY OF LIGHT (IN A VACUUM) GIVEN ABOVE.

VERTEX

IN AN OPTICAL SYSTEM, THE POINT OF INTERSECTION OF THE OPTICAL AXIS WITH ANY OPTICAL SURFACE IN THE SYSTEM.

VIDEO DISC

SEE: OPTICAL VIDEO DISC.

VIEW FIELD

IN GENERAL, THE MAXIMUM CONE OR FAN OF RAYS PASSED THROUGH AN APERTURE AND MEASURED AT A GIVEN VERTEX. NOTE: IN AN INSTRUMENT THE FIELD OF VIEW IS SYNONYMOUS WITH TRUE FIELD.

VIGNETTING

THE LOSS OF LIGHT THROUGH AN OPTICAL ELEMENT DUE TO THE ENTIRE BUNDLE OF LIGHT RAYS NOT PASSING THROUGH.

VIRTUAL IMAGE

THE POINT FROM WHICH A BUNDLE OF DIVERGENT LIGHT RAYS APPEAR TO PROCEED WHEN THE RAYS HAVE A GIVEN DIVERGENCE BUT NO REAL PHYSICAL POINT OF INTERSECTION. NOTE: THE DISTANCE OF THE VITRUAL IMAGE IS INVERSELY PROPORTIONAL TO THE DIVERGENCE OF THE RAYS. SINCE THERE IS NO PHYSICAL INTERSECTION OF RAYS THERE IS NO REAL IMAGE THAT CAN BE FOCUSED ON A SCREEN. THE IMAGE OF ANY REAL OBJECT PRODUCED BY A NEGATIVE LENS OR CONVEX MIRROR IS ALWAYS VIRTUAL. THE IMAGE PRODUCED BY A POSITIVE LENS OF AN OBJECT LOCATED WITHIN ITS FOCAL LENGTH IS ALSO VIRTUAL.

VISIBLE SPECTRUM

THE PORTION OF THE ELECTROMAGNETIC FREQUENCY SPECTRUM TO WHICH THE RETINA IS SENSITIVE AND BY WHICH HUMANS SEE. NOTE: IT EXTENDS FROM ABOUT 400 TO ABOUT 750 MILLIMICRONS IN WAVELENGTH.

VISUAL SPECTRUM

THE BAND OF COLOR PRODUCED BY DECOMPOSING WHITE LIGHT INTO ITS COMPONENTS BY THE PROCESS OF DISPERSION. NOTE: THE RAINBOW IS AN EXAMPLE OF A SPECTRUM PRODUCED BY THE DISPERSION OF WHITE LIGHT BY WATER DROPLETS. SEE ALSO: ELECTROMAGNETIC SPECTRUM.

VOLUME

SEE: MODE VOLUME.

W

WATCH

SEE: LENS WATCH.

WAVEFRONT

A SURFACE NORMAL TO A BUNDLE OF ELECTROMAGNETIC RAYS AS THEY PROCEED FROM A SOURCE. THE SURFACE OF THE WAVEFRONT PASSING THROUGH THOSE PARTS OF THE WAVES THAT ARE IN THE SAME PHASE. NOTE: FOR PARALLEL RAYS, THE WAVEFRONT IS A PLANE; FOR RAYS DIVERGING FROM OR CONVERGING TOWARD A POINT, THE WAVE-

FRONT IS SPHERICAL. THE WAVEFRONT IS PERPENDICULAR TO THE DIRECTION OF PROPAGATION OF THE WAVE, AND THE ELECTRIC AND MAGNETIC-FIELD VECTORS OF THE WAVE DEFINE A PLANE THAT IS TANGENT TO THE WAVE FRONT SURFACE AT THE POINT THAT THE FIELD VECTORS ARE DETERMINED.

WAVEFRONT CONTROL

THE PERFORMING OF OPERATIONS IN AN OPTICAL SYSTEM SO AS TO MANIPULATE THE SHAPE OF THE WAVEFRONT OF AN ELECTROMAGNETIC WAVE, USUALLY IN THE VISIBLE AND NEAR VISIBLE REGION OF THE FREQUENCY SPECTRUM, AND USUALLY WITH THE INTENT OF OBTAINING CLEAR IMAGES OF ILLUMINATED OBJECTS, I.E. OF OBTAINING A SPHERICAL WAVE FRONT. NOTE: AMONG THE METHODS OF WAVEFRONT CONTROL ARE PHASE CONJUGATION, APERTURE TAGGING, WAVEFRONT COMPENSATION, AND IMAGE SHARPENING.

WAVEGUIDE

ANY STRUCTURE CAPABLE OF CONFINING THE ENERGY OF AN ELECTROMAGNETIC WAVE TO A SPECIFIC RELATIVELY NARROW CONTROLLABLE PATH CAPABLE OF BEING VARIED OR ALTERED, SUCH AS A METAL PIPE OF RECTANGULAR CROSSECTION, AN OPTICAL GLASS FIBER OF CIRCULAR CROSSECTION, OR A COAXIAL CABLE. SEE: CLOSED WAVEGUIDE; DIFFUSED OPTICAL WAVEGUIDE; FIBER-OPTICAL WAVEGUIDE; HETEROEPITAXIAL OPTICAL WAVEGUIDE; MULTIMODE WAVEGUIDE; OPEN WAVEGUIDE.

SEE: SLAB-DIELECTRIC OPTICAL WAVEGUIDE; STRIP-LOADED DIFFUSED OPTICAL WAVEGUIDE; THIN-FILM OPTICAL WAVEGUIDE.

WAVEGUIDE DELAY DISTORTION

IN AN OPTICAL WAVEGUIDE, SUCH AS AN OPTICAL FIBER, DIELECTRIC SLAB WAVEGUIDE, OR AN INTEGRATED OPTICAL CIRCUIT, THE DISTORTION IN RECEIVED SIGNAL CAUSED BY THE DIFFERENCES IN PROPAGATION TIME FOR EACH WAVELENGTH, I.E. THE DELAY VERSUS WAVELENGTH EFFECT FOR EACH PROPAGATING MODE, CAUSING A SPREADING OF THE TOTAL RECEIVED SIGNAL AT THE DETECTOR. NOTE: WAVEGUIDE DELAY DISTORTION CONTRIBUTES TO GROUP-DELAY DISTORTION, ALONG WITH MATERIAL DISPERSION AND MULTIMODE GROUP-DELAY SPREAD.

WAVEGUIDE DISPERSION

THE PART OF THE TOTAL DISPERSION ATTRIBUTABLE TO THE DIMENSIONS OF THE WAVEGUIDE SINCE THEY ARE CRITICAL FOR MODES ALLOWED AND NOT ALLOWED TO PROPAGATE, SUCH THAT WAVEGUIDE DISPERSION INCREASES AS FREQUENCY DECREASES, DUE TO THESE DIMENSIONS AND THEIR VARIATION ALONG THE LENGTH OF THE GUIDE.

WAVEGUIDE MODE

SEE: DEGENERATE WAVEGUIDE MODE.

WAVELENGTH

THE LENGTH OF A WAVE MEASURED FROM ANY POINT ON ONE WAVE TO THE CORRESPONDING POINT ON THE NEXT WAVE; SUCH AS FROM CREST TO CREST. NOTE: WAVELENGTH DETERMINES THE NATURE OF THE VARIOUS FORMS OF RADIANT ENERGY THAT COMPRISE THE ELECTROMAGNETIC SPECTRUM; FOR EXAMPLE, IT DETERMINES THE COLOR OF LIGHT. SEE: PEAK WAVELENGTH. SEE ALSO: LIGHT.

WAVELENGTH DIVISION MULTIPLEX (WDM)

IN OPTICAL COMMUNICATION SYSTEMS, THE MULTIPLEXING OF LIGHT WAVES IN A

SINGLE MEDIUM. SUCH AS A BUNDLE OF FIBERS. SUCH THAT EACH OF THE WAVES ARE OF A DIFFERENT WAVELENGTH AND ARE MODULATED SEPARATELY BEFORE INSERTION INTO THE MEDIUM. NOTE: USUALLY SEVERAL SOURCES ARE USED. SUCH AS A LASER. OR A DISPERSED WHITE SOURCE. EACH HAVING A DISTINCT CENTER WAVELENGTH. WDM IS THE SAME AS FREQUENCY DIVISION MULTIPLEXING (FDM) APPLIED TO OTHER THAN VISIBLE LIGHT FREQUENCIES OF THE ELECTROMAGNETIC SPECTRUM.

WAVE OBJECT
SEE: SINE WAVE OBJECT.

WDM
SEE: WAVELENGTH DIVISION MULTIPLEX.

WHITE LIGHT
ELECTROMAGNETIC RADIATION HAVING A SPECTRAL ENERGY DISTRIBUTION THAT PRODUCES THE SAME COLOR SENSATION TO THE AVERAGE HUMAN EYE AS AVERAGE NOON SUNLIGHT.

WIDTH
SEE: LASER PULSE LENGTH

WIRE
SEE: CHICKEN WIRE.

X

Y

YAG/LED SOURCE
A LASER LIGHT SOURCE USED FOR OPTICAL FIBER TRANSMISSION CONSISTING OF A NEODYMIUM (ND) YTTRIUM ALUMINUM GARNET (YAG) CRYSTAL LASER USUALLY PUMPED BY A LIGHT-EMITTING DIODE (LED). NOTE: A YAG/LED SOURCE EMITS A NARROW SPECTRUM. ABOUT 200 MILLIMICRON WAVELENGTH. HOWEVER THE SOURCE IS INEFFICIENT AND BULKY.

YTTRIUM ALUMINUM GARNET SOURCE
SEE: YAG/LED SOURCE.

Z

ZEEMAN EFFECT

THE SPLITTING OF ELECTROMAGNETIC RADIATION INTO ITS COMPONT FREQUENCIES. I.E. THE SPLITTING OF SPECTRAL WAVELENGTHS (LINES) BY AN APPLIED MAGNETIC FIELD.

ZOOM LENS

AN OPTICAL SYSTEM THAT HAS COMPONENTS THAT MOVE IN SUCH A WAY AS TO CHANCE THE FOCAL LENGTH. WHILE MAINTAINING A FIXED IMAGE POSITION. THUS THE IMAGE SIZE CAN BE VARIED WHILE LEAVING THE OPTICAL SYSTEM IN A FIXED POSITION. SYNONYM: PANCRATIC LENS.